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The Massachusetts Medical Society.

THE SHATTUCK LECTURE.*

SOME PERIPHERAL NERVE PROBLEMS.

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From time to time interest is aroused in old problems. The introduction of new histological methods which permit of a more complete differentiation of tissues, thus rendering possible a new interpretation of old findings, or the occurrence of a large number of cases which demand new methods for their successful treatment are often followed by an intensive study of problems which were regarded as solved or at least as offering but few attractions in an investigative way. The introduction of the silver technique and the transplantation of tissues reopened the study of peripheral nerve regeneration. The great number of nerve injuries observed during and after the late war stimulated an intensive study of the method of repair after division and of procedures which might be employed to bridge defects or fill in a gap.

Controversies have been waged for a number

of years concerning the changes which occur in the peripheral segment of a nerve after division and their relation to repair and regeneration. That different interpretations of these findings might be made should not be regarded as unusual for in no tissue are degenerative and regenerative changes so closely associated both in time and space. It seems to me that we usually think of the nerve alone when considering repair and fail to remember that it is but a conducting link in the neuro-muscular system. In studying repair in this system it is necessary to study the nerve cell, the motor end plate, the periterminal network, the muscle fiber and the sensory disturbances which follow nerve section. The accurate and well-timed action of each is necessary to the reestablishment of function. One of the principal problems in connection with peripheral nerve surgery should be to determine which part of this complex system most often fails after attempts at repair. In the attempt to strengthen the weakest part of the chain, we may be able to devise some method which will give the greatest percentage of recoveries.

The changes occurring in the distal segment of a divided nerve and at the line of division will first be considered. Nasse in 1838 was the first to demonstrate that a nerve separated from its central connection always underwent degeneration. He gave the first anatomical de-

*The Shattuck Lecture, delivered before the Massachusetts Medical Society at Pittsfield, June 12, 1923.

scription of the degenerative changes occurring in a divided nerve. The changes were later studied by Budge and Waller. The latter's description was so accurate and significant that his name is associated with these changes. It is strange that the possibility of primary union after suture of a divided nerve should ever have been thought possible when these changes are so decided. This possibility has, however, been vigorously supported by Philippeaux and Vulpian, Walberg and Gluck. When Bethe some years ago again advanced the theory of peripheral regeneration, the possibility of primary union was again advanced and some clinical observations which were supposed to support this theory published.

One of the most striking things to me is that the distal segment of a divided nerve does not atrophy. Months after division the distal segment appears, at least to the naked eye, to be of the same size as the proximal. I have operated upon an external popliteal nerve twenty years after division and found the distal segment, although in no way connected with the proximal, of equal diameter. The only instance in which I have found what might be regarded as atrophy in a divided nerve occurred in a boy who had received two cuts in the right forearm, the result of being thrown through a glass. One cut occurred on the ulnar side of the forearm just above the middle, the other on the ulnar side above the wrist. The intermediate segment of the divided nerve had undergone distinct atrophy, being represented by a mere strand measuring six inches in length. Infection had occurred in this case, and it is possible that the atrophy may have resulted from infection. Some experiments conducted by Grauer, at my suggestion, seem to indicate, however, that an intermediate segment of a nerve, separated from both its central and distal connections, may undergo different changes from those usually observed in the distal segment of a divided nerve. The experiments above mentioned have not been made in sufficient number or advanced far enough to permit of definite conclusions concerning the fate of an intermediate segment.

The changes occurring in the distal segment of a nerve a few hours after division are very decided. Some of these are regressive in character, others regenerative. The regenerative changes in the distal segment are as essential to nerve repair as are those occurring in the neurofibrillae, and definitive nerve repair cannot occur unless these changes have taken place.

The most striking early changes occur in the myelin sheath. The myelin cylinder becomes irregular in outline. Often the border adjacent to the neurilemmal sheath becomes wavy and indented, so that the diameter of the myelin sheath varies considerably at different levels. The sheath later becomes broken up into pieces of greater or less length with rounded ends, ap-

pearing in the shape of a bottle, club, or string of pearls. Associated with these changes in form are changes in the reaction to stains. These changes are apparently passive, being secondary to alterations occurring in the neurofibrillae. The relationship is apparently confirmed by the method of development of myelin, which seems to be laid down usually proximalward first and to extend distalward as the neurofibrillae grow. Histological evidence would seem to show that the myelin is a product of the neurofibrillae.

Degenerative changes in the neurofibrillae occur early and at the same time as those in the myelin sheath. They may at first appear somewhat smaller than normal, but later become wider, irregular in outline and granular, finally breaking up into masses and granules which take a brown and ill-defined stain with silver, instead of the black and sharply defined stain of the unaffected neurofibrillae.

While these degenerative changes are occurring in the neurofibrillae and the myelin sheaths, a regenerative change is occurring in the neurilemmal sheath which permits of nerve regeneration. The structures resulting from these changes are as essential to nerve regeneration as are the neurofibrillae which develop from the proximal segment. Without the protoplasmic bands, which are the direct result of the changes about to be described, definitive nerve regeneration does not occur. It has been stated that nerve fibers can pass from their cell to their terminal distribution without the aid of these protoplasmic bands. It must be admitted that during development neurofibrillae grow from the brain into the cord; that experimentally the outgrowths of a developing nerve cell will grow upon the surface of culture media—nothing corresponding to the protoplasmic band being present—and that nerve fibers may grow through glia or other cells. These statements undoubtedly hold true concerning developing neurofibrillae. It is also true that neurofibrillae, although they may regenerate after division or injury, have an irregular growth and form a dense network at the line of division or injury unless there are bands formed from the neurilemmal sheath to conduct them to their end-organ. Definitive regeneration of the optic nerve and spinal cord fails to occur even when the neurofibrillae regenerate in large numbers, because of the absence of these conducting and directing bands. Failure of definitive regeneration in the optic nerve and spinal cord is due to the absence of neurilemmal sheaths, from which the protoplasmic bands develop which form the pathways by which the developing neurofibrillae reach the end organs.

The changes leading to the formation of protoplasmic bands from the neurilemmal sheaths were first described by Büngner. The early changes consist of a volume increase in the nucleus and the appearance of mitoses. The pro-

toplastm about the nucleus increases in amount and is displaced into the lumen of Schwann's tubule. Even as early as the third day after division some of the nuclei have been displaced into the tubule and lie between the balls of myelin. The protoplasm surrounding the nucleus begins to proliferate, and may be displaced within the tubule to lie between the balls and masses of myelin.

These bands do not develop from the distal segment alone. In studying the repair of nerves over gaps—a fascial tube being used to bridge the defect—Kirk and Lewis found that these bands also develop from the cut neurilemmal sheaths at the end of the proximal segment. The protoplasmic bands of the proximal segment grow downward into the tube, and in a defect measuring an inch in length such downgrowths will bridge at least five-sixths of the distance. At this level they meet and evidently unite with similar bands developing from the proximal end of the distal segment.

There is no evidence that neurofibrillae ever develop from the protoplasmic bands. The striations observed by Büngner were shown not to be neurofibrillae when silver stains were introduced, and the neurofibrillae demonstrated by Bethe, using vital stains, were undoubtedly ingrowths from adjacent nerves which had been divided.

The relation between the protoplasmic band and neurofibrillae has been discussed at some length, because definitive regeneration of a nerve depends upon both. One of the chief problems of nerve surgery is to provide easy and unrestricted access of the regenerating neurofibrillae to the protoplasmic bands.

The importance of protoplasmic bands in nerve regeneration is now generally admitted. No definitive regeneration occurs without them. There is still considerable difference of opinion as to the position of the developing neurofibrillae in the bands. Ranson, who has paid particular attention to the protoplasmic bands, states that the regenerating neurofibrillae are always within the bands, and never in the tissues between them. Dustin, on the other hand, while admitting that frequently the neurofibrillae use the bands as conducting paths, has never been convinced of the intraprotoplasmic position of the fibrillae. The protoplasm of the proliferating sheath, which becomes confluent to form a syncytium, fills up the space within the neurilemmal sheath. This protoplasm becomes vacuolated. The vacuolization has been particularly emphasized by Boeke, whose illustrations show beautifully this change. According to Boeke the neurofibrillae are practically always intraprotoplasmic, occurring in the protoplasm surrounding the vacuoles. Some neurofibrillae undoubtedly pass in the connective tissues surrounding the bands. These fibers have been seen by all those who have been interested in nerve repair. Bethe claimed that these fibers passed

but a short distance in the distal segment and that they degenerated. Boeke, on the other hand, believes that the fibrillae entering the endo- and perineurium may pass the entire length of the distal segment and eventually form end organs which may function. These fibers, which are few in number and can practically be disregarded in nerve repair, grow much more slowly than those entering protoplasmic bands and therefore reach their end organs much later.

Anything which interferes with the access of neurofibrillae to protoplasmic bands seriously interferes, if it does not prevent, nerve regeneration. Careful approximation of the ends of nerve segments without hematoma or scar formation is a *sine qua non* of successful peripheral nerve surgery—accurate apposition preserving the anatomical relation of the funiculi is also essential because of the method of repair, the conducting part of the nerve fiber being directed to the end organ by the protoplasmic band. As previously stated, the nerve proper forms but one link in the chain. It is necessary in evaluating the importance of the different links, to determine what changes occur in the terminal links of the chain—the connecting links between the nerve and muscle. Failure of regeneration at these points would seriously interfere with the reestablishment of function.

Before discussing the changes occurring in the motor end plates following section and repair of a peripheral nerve, which have been studied especially by Cipollone, Tello, Boeke, and Huber, it may be well to review their structure. The motor end plate in the higher vertebrates appears as a flattened, branched termination of the neurofibrillar substance of the nerve fiber of which it is the end organ. It is situated beneath the sarcolemma. In many cases the end plate is collateral, being attached to the main fibers by short lateral branches, while in other cases it represents the terminal branches of a long nerve fiber. At times an end plate seems to be intercalated in the course of a nerve fiber. The terminal bulbs or loops, as the case may be, are formed by loosely collected neurofibrillae.

As the nerve fiber passes beneath the sarcolemma it apparently loses its neurilemmal and myelin sheaths. In discussing regeneration it is important to determine whether or not the neuromuscular system is to be regarded as closed or whether there is a break in it at the junction of the nerve or muscle fiber just outside the sarcolemma. There are certain nuclei in the sole plate which seem to be homologous with the neurilemmal sheath cells. The behavior of these during degeneration and regeneration of the motor end plate will be discussed later.

The end bulbs or loops of the end plate do not lie free in the granular substance of the sole plate. In well-stained preparations there is found, as has been especially emphasized by Boeke, a fine meshed, netlike structure, to which the name of periterminal network has been

given. This network is intercalated between the motor end plate and the heaped up sarcoplasm of the sole plate. The fibers of this network evidently establish a connection between the end plate and the sarcoplasm. The peritendinous network disappears after degeneration, of the neurofibrillae, and the changes which occur during regeneration, as pointed out by Boeke, indicate that it is reestablished after degeneration, by the neurofibrillae.

Degenerative changes in the fibrillae of the motor end plates appear early after nerve section. The fibrillae appear swollen, the swelling taking place at quite definite places, and finally they break up, much as do the fibrillae of the nerve proper, and disappear.

The first changes in the sole plate following nerve section or crushing occur relatively late. When the granular fragments of the neurofibrillae have disappeared, the sarcoplasm of the sole plate surrounded by large pale nuclei becomes quite distinct. The nuclei of the sole plate undergo much the same changes as will be noted later when discussing the changes occurring in muscle as the result of nerve division. Increase in the nuclei is amitotic in character. Within fourteen days the changes occurring in the sole plate have reached the maximum. No further changes occur until regeneration begins.

It is important to determine the way in which the neurofibrillae reach their terminal organs, and whether they reach them relatively rapidly and in sufficient number to restore those lost as a result of degenerative changes following nerve section.

Regenerating neurofibrillae while in the nerve proper usually pursue a regular course. As they reach the terminal end organ this growth becomes irregular. The thickness of the fibrillae vary—some of Schwann's tubules are empty, some are filled. Some of the neurofibrillae evidently take a retrograde course. All the histological evidence would seem to indicate the neurofibrillae developing in the terminal portion of the nerve are far in excess of the number necessary to reconstruct an end organ and that they are gradually reduced in number as the end organ and the sole plate approach the normal.

In discussing nerve repair it is important to determine what factors determine the growth of the neurofibrillae. Tello believes that there are certain substances which develop in the sole plate during degeneration which exert a chemotactic influence upon the neurofibrillae. Such chemotactic substance would account for the growth of the fibrillae beyond the point at which the neurilemmal sheath ends and for the peculiar formation of the motor end plates in the early stages.

There is no evidence of any kind to support this theory regarding a chemotactic substance. There is definite histologic evidence which seems to show that the protoplasmic bands pass into

the sarcolemma and that the neuromuscular apparatus is a closed unit. This has been demonstrated by Boeke. Evidently the cells of arborization, which have been described in the motor end plate and have been regarded as the homologues of the sheath of Schwann cells, take no part in the formation of the terminal parts of the protoplasmic band, for they seem to degenerate following section of the nerve.

Developing neurofibrillae undoubtedly have an enormous growth energy. This is seen particularly in neuromas. In these the regenerative drive is not sufficient to force the neurofibrillae through scar tissue. The fibrillae then, following the lines of least resistance, turn back upon themselves within their own sheaths, often spiraling upon the neurofibrillae of the Schwann tubules, to which they belong, to form the spirals so characteristic of neuromas. These changes would seem to indicate that developing nerve fibers follow in their growth the paths of least resistance. They may seek the distal segment when the proximal is not too far separated from it. This phenomenon is frequently seen in cases in which a heterotransplant is used to bridge a gap. Frequently in such instances the transplant dies, death of the transplant being indicated by its diffuse brown or black stain with silver. In such cases it is not at all uncommon, as is shown beautifully in some of Huber's specimens, to find the neurofibrillae growing down on the outer side of this transplant to reach the distal segment. Such regenerative drive is, I believe, seen much more frequently in experimental animals than in man. In animals, especially in rabbits, neurofibrillae will not infrequently grow across a gap to reach the distal segment of a divided nerve.

The behavior of the different parts entering into the formation of the neuromuscular unit during degeneration and regeneration have been reviewed at some length. This has been done in order to determine whether the terminal portions of this unit, forming the connecting link between the nerve and the muscle, might regenerate with difficulty, if at all, and thus be an important factor in preventing the reestablishment of function after the divided nerves have been sutured.

All the histological evidence which has accumulated would seem to indicate that if free and easy access to the protoplasmic bands of the distal segment is once offered, that the neurofibrillae pass fairly rapidly to the distal end organs and in sufficient numbers to reconstruct them. In fact, in the early stages, the fibrillae are in excess of the number needed, and as the end organs approach the normal these are reduced in number.

One of the principal problems in peripheral nerve suture, then, concerns the ends of the segments. Removal of scar tissue and the prevention of hematoma formation at the line of su-

ture are necessary if successful suture is to be expected. Once the neurofibrillae have passed into the protoplasmic bands of the distal segment, regeneration of the end plates, based upon histological findings, may be expected.

Complete restoration of the nerve does not occur until the myelin sheath is reformed. Muscle movements evidently can be carried out before complete myelinization, but the peculiar tingling caused by striking the nerve causes considerable discomfort. Kirk and Lewis, in an earlier work dealing with nerve regeneration, believed that they found that myelin was laid down by the axis cylinders, and that this deposition began proximalward and extended distalward. Boeke and others have described myelin surrounding neurofibrillae between muscle fibers, at an early stage before complete myelinization had occurred. These findings would seem to indicate that myelin might be laid down in any part of the neurofibrillae. It seems in most cases to appear first about the oldest part of the fibrillae. Degenerative changes occurring in the myelin after nerve division would seem to indicate that the breaking up of the myelin is a passive process secondary to the changes occurring within the neurofibrillae.

The histological changes occurring during regeneration indicate the methods which should be followed in nerve repair. The causes of failure are most commonly found at the site of suture, excluding those cases in which the changes in muscle resulting from an ischemia prevent the return of function even after perfect nerve suture.

The tubules of a transplant may conduct neurofibrillae, but this segment of a nerve after regeneration usually contains considerable scar tissue. Huber and Lewis at one time used as transplants segments of nerve in which Wallerian degeneration had already been established. It was hoped that if such a transplant were used that the neurofibrillae would pass through them more quickly. Experimentally it had already been shown that a nerve in which Wallerian degeneration had occurred was more readily transplantable on culture media than one in which it had not occurred. The results following the use of such a transplant in animals did not differ from those occurring when the ordinary transplant was employed.

The reported results of transplants employed clinically vary greatly—from a large number of successes to complete failures. I have seen no definite successes following the use of transplants. It seems very probable to me that the scar forming at the distal end of the transplant and the proximal end of the distal segment might form a block for the developing fibrillae. In some cases the transplant undoubtedly enlarges. It would be well in such cases to expose the transplant, and if any fibrillae had entered it to resect the distal end and resuture. To find a method which will successfully bridge a gap

or fill in a defect still remains a problem of peripheral nerve surgery.

The factors concerned in the production of muscle atrophy following nerve division demand careful consideration. The rapid and complete restoration of function following nerve suture is rendered more certain and effective if the atrophy can be prevented, or at least reduced to a minimum.

In studying the histological changes occurring in muscle following section of its motor nerve one cannot help being struck with the similarity of changes occurring in it and the distal segment of the nerve. Degenerative and regenerative changes are intimately associated, and it seems as if the foundations for repair were being laid while degenerative changes were occurring in the contractile substance of the muscle.

Considerable difference of opinion has been expressed concerning the changes which occur in a muscle whose motor nerve has been divided. A simple decrease in the size of the muscle fibers, among which may be found hypertrophic ones, has been described; also a complete disappearance of the contractile elements, which are replaced by fat and scar tissue.

Loss in weight is probably one of the most constant phenomena occurring in muscle after nerve section. In some of the experiments conducted by Ricker there occurred as much as 71 per cent. loss of weight on the fifty-first day following section of the motor nerve.

It is difficult to produce a complete atrophy of a muscle, even after division of all the motor nerves of the extremity. In a muscle which presents distinct histological evidence of atrophy there are fibers which show no such change. These may be quite abundant and may account for the rather rapid return of motor power in some cases. Nerve section is often followed by thickening of some fibers of the muscle. This is due usually to edema or hyaline changes. As late as four months or more after nerve division many of the fibers are of normal or greater than normal width. The histological changes are not evenly distributed throughout the muscle, and rapid disintegration of muscle fibers does not occur, although definite fatty changes may be seen. Atrophy is accompanied by a definite reduction in the number of fibers. It is difficult to determine the way in which this reduction occurs or what causes it.

Probably the most striking histological changes after division occur in the nuclei of the muscle fibers. These are observed within ten days. The nuclei become arranged in columns or groups. Such columns or groups of nuclei occurring at unequal distances from each other are not found in normal muscle. The significance of this increase is a matter of dispute. These nuclei are thought by some to indicate an attempt at regeneration, while others think that the nuclei are merely more prominent because of changes in the contractile substance, and that

there is no actual increase. These nuclei are counted with difficulty, but alterations in form and chromatic content, together with their position in the cell, would indicate that there is an actual increase in number. The absence of karyokinetic figures has been used as an argument against an actual increase in number. It must be admitted that the division is amitotic; new nuclei being formed by the large clear ones by a progressive constriction and separation into two or more. Direct division is the type of nuclear increase observed in muscle after nerve division. Huber, in his work upon the development of muscle, has shown that karyokinetic figures are rarely observed, even in the rapidly developing muscles of the embryo, division practically always being amitotic in character.

In discussing the nuclear increase in the sole plate following nerve section it has already been noted that this nuclear increase is amitotic in character. These nuclei are also connected with the sarcoplasm. The nuclear changes are apparently somewhat different from those occurring after trauma, but when we consider that amitotic nuclear division occurs in rapidly growing muscle, it seems that Ricker is hardly justified in regarding the nuclear changes as indicative of a slow, protracted, regressive phenomenon which ends eventually in disappearance of the nucleus and total degeneration of the muscle fiber. These nuclear changes seem to me not unlike those which occur in neurilemmal sheaths of the distal segment, and I believe are the first indications of attempt at repair. Regressive and regenerative changes are closely associated both in time and space in the muscle as in the nerve. It has been exceedingly difficult to study the changes occurring in muscle during recovery after nerve suture, and at the present time no definite statement can be made concerning it.

As already stated, the amount of atrophy following nerve division and injury varies considerably in amount, and the exact cause of the atrophy is not definitely known. Kato and Langley have advanced the theory that muscle atrophy is due to exhaustion following fibrillary twitching. Fibrillary twitching usually begins a day or more after division of the motor nerve of a muscle. The metabolic changes in the muscle must apparently reach a certain intensity before fibrillary twitchings begin. It is not always easy to determine the degree of fibrillary twitching, and when the twitchings are feeble careful observation is required to make them out. There is apt to be some variation in the intensity of the fibrillary twitching in different muscles or in different parts of the same muscle. For example, in the tibialis anticus the twitching is most active in the upper portion. Adjacent muscle fibers seem to be differently affected, for when twitchings are not active, they may be distinct in some fibers while slight or very indistinct, if

not absent, in others. When fibrillary twitching is active short indentations measuring about 1 mm. in length appear upon the surface of the muscle fibers. When fibrillary twitching is slow the indentations may vary from 1 to 4 mm. in length. The immediate cause of this twitching is probably an increased permeability to salts.

This theory of muscular atrophy has not been generally accepted; in many ways the changes occurring in a muscle after nerve division are not unlike those of disuse atrophy. Muscle atrophy is apt to be very marked in irritative lesions of nerves. Causalgia, in which the nerve is not divided and through which apparently impulses may be transmitted, is often associated with the most marked muscle atrophy. The ordinary movements are restricted because of the fear of paroxysms of burning pain which develop when attempts at movement are made. Other factors may contribute to the atrophy occurring in irritative lesions, but certainly disuse is an important factor.

It has also been suggested that some of the changes occurring in muscle following nerve division are due to venous stasis—neuroparalytic hyperemia. The contractile substance of muscle succumbs more easily to venous stasis than to the anemia following occlusion of the principal artery. The susceptibility of the contractile substances to venous stasis is shown in ischemic palsy. In some cases of atrophy and fixation the changes seem to be more of the nature of an ischemic palsy than of atrophy occurring with nerve lesions.

We have been accustomed to think that a muscle when stretched undergoes atrophy, or at least loses considerable function. This is undoubtedly true if the muscle is stretched for some time and if the stretching to which it is subjected is excessive. Some experiments recently published by Meyer would seem to show that under favorable conditions stretching of a muscle or a group of muscles, even when inactive, does not necessarily cause atrophy. Such muscles may even undergo hypertrophy.

In these experiments the leg of an animal was fixed in such a position that the extensor group of muscles was stretched and the flexor group relaxed. After 14 days, hypertrophy of the stretched muscle was noted. This hypertrophy became most marked after three or four weeks, but could be observed as late as seven weeks. His experiments were not conducted beyond this period. Normally muscles are in a state of slight contraction. This slight contraction is muscle tone. As tone is contraction metabolic changes occur. Sulger has shown that tone is accompanied by metabolic changes and that there is an increased kreatinin formation, while in the toneless muscle there is no increase of kreatinin.

A stretched muscle loses its tone. Tone without movement, such as occurs in fixation of an

inflamed joint by a cast, leads to atrophy, while the loss of tone such as occurs after posterior root resection or through stretching, is not accompanied by atrophy, and may even be accompanied by hypertrophy. Section of the nerve does not interfere with or prevent this phenomenon described by Meyer. Whether or not this explanation is correct, the phenomenon above described is interesting, for it is contrary to many of the views now held regarding the effect of the stretching of muscles. That the hypertrophy is real has been established by the histological examinations of Froboesa. The enlargement is not due to edema or the increase of the connective tissue elements of muscle fiber.

It has seemed to me that the use of rigid splints to prevent stretching of paralyzed muscles is not beneficial. Rigid fixation is accompanied by fibrosis of the smaller joints and by changes in the ligaments which may prevent the reestablishment of function. Function should be reestablished at an early date, and I believe that some elastic apparatus should be employed in all cases. The muscle may be kept in the neutral position when at rest, but the apparatus should be so constructed that the paralyzed group of muscles may move freely and be brought back again into the neutral or slightly over-corrected position when the movement has been accomplished.

Langley, in discussing his theory of atrophy, makes some interesting remarks regarding the use of splints. He believes it incorrect to speak of a paralyzed muscle as being over-stretched by its antagonists. They are not stretched more than they sometimes are during ordinary movements. The tension is less, since their tone is abolished. The stretching is not injurious in itself. The long, unbroken continuance of the stretching damages the muscle, and the tonic shortening of the antagonists is not injurious unless long continued.

Rigid dressings, fixing paralyzed groups, are, I believe, bad and may seriously interfere with the return of function. Elastic dressings, which permit of motion and allow the paralyzed muscles to simulate as closely as possible their normal function, may prevent to some extent the atrophy occurring after nerve division and permit of an early return of function.

The changes occurring in a nerve following a constriction and its removal, attended by a rapid return of function, have not been established. Clinical experience would seem to indicate that the conducting power of a nerve may be totally suspended for months and that within a few days following removal of the constricting band motor function may return. I have seen return of motion in the extensor muscles of the forearm within ten days following the removal of a very delicate constricting band which reduced the diameter of the musculospiral nerve by one-half. The paralysis had been present for six months. Delicate scar tissue about a nerve

in which there are no evidences of intraneural scar may cause the same suspension of function. It is difficult, almost impossible, to reproduce these conditions experimentally. In such cases there seems to be merely a suspension of function. Little degeneration, if any, exists, for such rapid return of function is not observed after the changes occurring in the neuro-muscular unit following division of its motor nerve.

Incorrect ideas concerning the extent of anesthesia which follows division of a sensory or mixed nerve and the way in which sensation later returns, if a successful suture is performed, account for many of the bizarre statements which have been made concerning the sensory disturbances following nerve division. The presence of an area in which certain types of sensation may be perceived within the anatomic region supplied by a certain nerve often leads to a postponement of any operative interference, because the presence of such an area is regarded as an indication of recovery. Anesthesia and imperfect return of the different forms of sensation may be the cause of marked disability after nerve division.

Head's investigation into the nature of cutaneous sensation may be briefly reviewed. The hypothesis may be summarized as follows: Cutaneous sensibility is mediated through two afferent nervous systems. From an evolutionary viewpoint these are of different age. The older and more fundamental is the protopathic. This system is capable of responding to painful cutaneous stimuli and extremes of heat and cold. It is the great reflex system producing a rapid, widely diffused response, unaccompanied by any definite appreciation of the locality of the spot stimulated. The other, the epicritic system, represents a higher development. It is the system by which we perceive cutaneous localization, discriminate between two points and the finer degrees of temperature. After nerve division the area of total anesthesia is always smaller than the area supplied anatomically by the severed nerve. There is a spatial dissociation after nerve division and as a result the loss of epicritic sensibility is generally more extensive than the loss of protopathic, and consequently there is an area in which protopathic sensation alone is preserved. The relative distribution of loss of sensibility after nerve division is not always that described above for there occasionally appear areas within such a zone which are supplied by epicritic sensibility alone. Besides a spatial dissociation, there is also a temporal dissociation, for protopathic sensibility returns after successful nerve repair before epicritic, which does not begin to return until the return of protopathic sensibility is almost or entirely complete. During the recovery of sensation following nerve suture, the area in which protopathic sensations are perceived gradually encroaches upon the area of total anesthesia, which finally disappears, and epicritic sensation fol-

lows the protopathic so that ultimately the sensibility is reestablished.

While the theory advanced by Head as to the reasons for these peculiarities in return of sensation have been criticized, there is no argument over the clinical findings in sensation as outlined by Head. There are certain findings which seem to show that the fibers mediating protopathic sensation may regenerate earlier and under less favorable conditions than those mediating epieritic. According to Head, protopathic sensibility is restored under conditions which materially hamper the return of higher forms of sensibility. The formation of fibrous tissue between the two ends of a nerve greatly retards the restoration of sensation, but cases have been observed in which when this fibrous tissue was removed at operation for secondary suture, it sometimes happened that the extent of protopathic loss was increased. This increase must have been due to the removal of nerve fibers intermingled with fibrous tissues which were capable of endowing the part with protopathic sensibility. Here a condition capable of preventing the return of higher forms of sensation did not form an effectual barrier to the regeneration of fibers subserving protopathic sensibility.

Pollock, in a very careful analysis of protopathic sensibility based upon the study of over 1000 nerve injuries, comes to different conclusions than does Head. He does not believe that the fibers which mediate protopathic sensibility develop earlier than those mediating epieritic or that they may regenerate under less favorable conditions. He states that the laws governing the assumption of function by nerves adjacent to a severed nerve are unknown. Evidence of assumption of function by nerves adjacent to a severed nerve is not present immediately following the nerve injury, but gradually becomes manifest at a later date. The early return of the sense of prick pain before the return of the sense of touch is not the result of the temporal dissociation of epieritic and protopathic sensibilities but is due to the assumption of function by adjacent overlapping nerves. The area of overlap can be determined with considerable accuracy and the early return of the sense of prick pain cannot be interpreted as a sign of regeneration of the divided nerve. The changes in prick pain following division of a single nerve are not a safe basis for conclusions regarding regeneration of that nerve. Return of sensibility to prick pain can be used clinically for the determination of nerve regeneration only when it is accompanied by return of tactile sense or when it occurs outside the area of possible overlap of adjacent nerves.

Different theories have been established by different investigators as to sensation. There is considerable disagreement. It is a well established fact clinically, however, that the area of total anesthesia following division of a sensory

or mixed nerve is never equal in size to the area supplied by that nerve, and that bordering upon this area of anesthesia is an area in which the prick pain can be felt—the two compass points at a distance, recognized as such; and the greater degrees of heat and cold differentiated. That such changes in sensation should be kept in mind is of importance; for, as stated above, the presence of a zone of protopathic sensibility within the area supplied by the divided nerve has often been interpreted as indicating return of function, and as a consequence operations have been delayed and an incorrect prognosis given. Epieritic sensation reappears—if nerve analgesia becomes smaller, returning to areas repair is going on successfully—as the area of which were formerly characterized by protopathic sensibility. Epieritic sensibility is, however, restored slowly; and, even after motor function has returned, epieritic sensibility may be absent in some part of the area involved. Recovery to epieritic sensibility in many instances is never complete and failure of complete recovery may account for some of the only partial successes after nerve suture.

Hyperesthesias following nerve injury are rather uncommon. I have seen hyperesthesia following division of the dorsal cutaneous branch of the ulnar nerve, but it was not marked and the mental condition of the patient rendered it rather difficult to determine really how much hyperesthesia was present. In some cases of recovery after suture, hyperesthesia has been very marked. I have seen two cases of musculospiral recovery, which occurred rapidly after suture, in which the hyperesthesia of the skin over the dorsum of the forearm was marked. It is strange that in these cases in which the area of analgesia following nerve section is so small, recovery following suture should be accompanied by such marked hyperesthesia.

Alexander Denmark, in 1813, gave the following description of the symptoms and lesions of a man wounded at the storming of Badajoz: "The point of entrance of the ball was $1\frac{1}{2}$ inches above the internal condyle of the humerus; the point of exit on the outer side in front of the elbow joint. I also found him with the forearm bent and in supination, supported by the other hand. The pain was burning in character and so violent as to cause continual perspiration from his face. This pain began at the extremities of the thumb and all the fingers with the exception of the little one and extended up the arm to the wounded part. There were excoriations upon the hand from which exuded an ichorous discharge."

In 1864 Weir Mitchell, Morehouse and Keen described a number of cases which were much like those described by Denmark. The following is Weir Mitchell's description of this condition: "The skin affected in these cases was deep

red or mottled, or red and pale in patches. The epithelium appeared to have been partially lost, so that the cutis was exposed in places. The subcuticular tissues were nearly all shrunken and where the palm alone was attacked the part so diseased seemed to be a little depressed and firmer and less elastic than common. In the fingers there were often cracks in the altered skin and the integuments presented the appearance of being tightly drawn over the subjacent tissues. The surface of all the affected parts was glossy and shining as though it had been skillfully varnished. Nothing more curious than these red and shining tissues can be conceived of. In most of them the part was devoid of wrinkles and perfectly free from hair. Mr. Paget's comparison of chilblains is one often used to describe these appearances, but in some instances we have been more strikingly reminded of the character of certain large, thin and polished scars." The characteristic of causalgia is the burning pain and not the atrophic skin. This sometimes occurs in nerve lesions, but is not associated with the peculiar, burning, distressing pain of causalgia.

I believe that the changes in the skin vary in different cases of causalgia. In some the reddish blue or mottled skin is found, while in others the peculiar glossy skin is noted. Whether they are merely stages in development or not is difficult to say. I have now under observation a case of median nerve injury in which the skin is not atrophic or glossy. It is bluish red or mottled and has none of the atrophic changes described so well by Weir Mitchell.

The ulceration of the hand with the foul smelling discharge is undoubtedly due to trauma produced in attempts to relieve the nagging, distressing burn. I have seen one case of a gunshot wound in the neighborhood of the median nerve, the nerve not being divided, in which there was a large ulcer of the palm of the hand which had been produced by the patient who violently scratched the palm of the hand in an attempt to relieve this pain.

The cases of causalgia that I have seen have been injuries of the median and internal popliteal nerves or the tissues adjacent to them. The nerves have not been divided, or if divided, have been sutured, the burning pain developing after the nerves were repaired. One of the cases of causalgia followed an electric burn of the index finger; another a division of the median nerve just above the wrist-joint. In the latter instance the nerve was divided by broken glass. It is peculiar that this clinical syndrome occurs practically only after injuries of the median and internal popliteal nerves. In one case observed by me some causalgia remained after an alcoholic injection of the internal popliteal nerve. The residual causalgia was later relieved by an injection of the long saphenous nerve.

The most constant lesion in these cases has

been a neuritis. The tissues about the nerve seem somewhat indurated and edematous, the epineurium is thickened and the vessels are dilated, enlarged and tortuous. It is difficult to explain this peculiar burning agonizing pain, which is so constant and nagging that it changes the disposition of the patient. Causalgia tends to subside spontaneously. The injection of 60 per cent. alcohol into the nerve above the site of injury will stop the pain and by the time that the effects of the injection have ceased, the patient has recovered. I have not had the opportunity of noting the end changes in many cases of causalgia. In one of the worst cases that I have seen, an alcohol injection controlled the pain, and three years later the hand was practically normal with the exception of the atrophy which still remained in some of the muscles of the hand. The condition of the skin had markedly improved, and the patient, who was a pharmacist, carried on his work easily. The syndrome now under consideration occupies a special and peculiar position in diseases of the peripheral nerves. The peculiar character of the pain, recurring on attempts at motion, renders movement of the hand practically impossible. Atrophies of the muscle and skin rapidly develop and the relation of disuse and inactivity to the rapidly developing atrophies of both the skin and muscle remains a problem which must be considered and a fertile topic for discussion. I do not believe that the relation of peri-arterial sympathectomy to recovery of causalgia has been sufficiently well established to warrant discussion.

Muscle movement is complex, sensation and motion being dependent upon factors demanding perfect coordination. Even when the mechanical part of nerve repair is satisfactory some failure in coordinating the different factors concerned in motion may vitiate or render imperfect good repair. Stopford recently has published some interesting observations. While examining some patients upon whom a suture of the median nerve had been performed, he found that all the muscles when tested individually had recovered voluntary power, but that the hand was of slight practical service when the patient attempted passive movements made necessary on his return to work. These patients complained that they lost the grip on their tools and on further inquiry it was found that they could use the hand fairly well as long as they concentrated upon the movements, but it failed to function satisfactorily as soon as they ceased to watch what it was doing. Several volunteered the information that the hand was useless in the dark or when they were unable to observe what they were trying to do with it. Such complaints were made by patients some three or more years after the performance of end-to-end suture, even when the cutaneous sensation had made a fair recovery and all the muscles, when tested individually, exhibited good volun-

tary power. It seemed clear that such a disability could be due only to a loss of afferent stimuli from joints, muscles, tendons and other deep structures.

It is in such cases as these in which the return of motor power is good but the result is impaired as a result of loss of deep sensibility—which is an integral part of the chain upon which function depends—that the problem of determining the cause of failure of return of deep sensibility arises.

In an attempt to obtain a greater percentage of perfect or almost perfect recoveries in nerve suture an effort must be made to perform surgical work at the earliest possible period—primary sutures being preferred—and to restore as nearly as possible the pattern of divided nerves. Whether the work of Stopford or of Langley dealing with internal topography is accepted or not, it can be stated without fear of contradiction that the surgeon who restores most nearly to the normal the pattern of divided nerves will secure the highest percentage of nearly perfect recoveries.

Original Articles.

HEART DISEASE IN PREGNANCY.*

BY WILLIAM B. BREED, M.D., BOSTON,

AND

PAUL D. WHITE, M.D., BOSTON.

It is the main purpose of this communication to outline the problem presented by heart disease in pregnancy. With this object in mind, we shall report end-results in 102 consecutive cases referred from the clinic of the Boston Lying-In Hospital to the Cardiac Clinic of the Massachusetts General Hospital, between September, 1920, and April, 1922, and shall analyze them in the hope of reducing the number of prognostic errors in the future.

The specific question that must be answered is: "Will this particular patient be able to continue normally through pregnancy and labor without cardiac damage to herself?" The moral question as to the degree of importance of the baby's life compared with that of the mother, or the purely personal consideration of longevity of the patient in relation to the possession of a live baby, has no immediate bearing upon the present problem. Likewise, the obstetrical procedures in the conduct or termination of pregnancy are not our immediate concern. Decision in such matters must come after the answer to the first and more fundamental question has been found.

*Read before the Boston Association of Cardiac Clinics, January 18, 1923.

DIAGNOSIS OF HEART DISEASE IN PREGNANCY.

Of primary importance in the quest of such answer is the establishment or elimination of organic disease. Cases for decision come to the attention of the physician for two reasons: either because of the subjective symptoms of dyspnea, palpitation, fatigue, and so forth; or because of the presence of cardiac enlargement, murmurs of one sort or another, tachycardia, arrhythmia, and other signs found in routine examination of the chest, which abnormalities may or may not be associated with subjective symptoms. Each of these cases must first be classified either as one of organic heart disease, or as one having a normal heart in the presence of effort syndrome, irritable heart, or neurasthenia.

How may we distinguish the patients with organic heart disease from those so often found with effort syndrome or premature beats? Symptomatology alone does not help us, since there are no pathognomonic symptoms of heart disease. Dyspnea, precordial pain, and palpitation may all occur in effort syndrome or other conditions not true heart disease. We must look for certain pathognomonic signs: (1) cardiac enlargement, (2) diastolic murmurs heard anywhere over the precordium (aortic regurgitation, mitral stenosis, patent ductus arteriosus, pulmonary regurgitation), (3) a loud systolic murmur at the apex masking the first sound (organic mitral regurgitation), (4) a loud systolic murmur at aortic or pulmonary area, attended by thrill (aortic stenosis, pulmonary stenosis, or aneurysm), (5) auricular fibrillation, (6) heart block not the result of digitalis action, (7) pulsus alternans (not, however, during paroxysmal tachycardia), and (8) pulsating liver. Certain other signs such as cyanosis, pulmonary oedema, engorgement of neck veins or liver, and ascites, should make one suspect heart disease and search for pathognomonic evidence, just as the presence of symptoms such as dyspnea, heart pain, and palpitation, point to the need of the study of the heart to exclude heart disease. A clear history of rheumatic fever or chorea in the past must make one very suspicious of heart disease because of the large percentage of such individuals with cardiac damage. A history of syphilis or a positive Wassermann reaction may mean syphilitic heart disease or aortitis. Finally, there are a few findings, such as oedema of the feet and clubbed fingers, that may or may not mean heart trouble.

ETIOLOGY.

Having established the presence of organic heart disease, the etiological factor in each case should be determined; because etiology is more the basis for prognosis than structural change or symptoms.

Congenital heart disease is rarely met with in pregnancy, and when met is easily disposed of. If a patient with congenital heart disease has

survived to the age of childbearing period without signs of incapacity for normal activity, she will certainly be able to pass through pregnancy and labor without difficulty. Mackenzie¹ has seen only one case of congenital heart disease in a pregnant woman—a case of patent ductus arteriosus. This woman, having been free from cardiac symptoms before pregnancy, was advised to continue, which she did without mishap. Since this is the only example of such cardiac disease associated with pregnancy that can be found in the literature we have no other data upon which to base prognosis in a pregnant woman with congenital heart disease. As it is well known that patent ductus arteriosus is the most innocuous of congenital heart lesions, it is of course unwise to use this as an example of congenital heart disease in general. Certainly pulmonary stenosis would afford a much greater risk.

Arteriosclerotic heart disease is obviously not an important factor in this particular problem. In the present series neither arteriosclerosis nor congenital heart disease was encountered. No mention of arteriosclerosis in pregnancy can be found in the literature.

Non-Rheumatic Infectious Heart Disease.—If we exclude now from the group of pregnant women with infectious heart disease those with the "rheumatic" type resulting from rheumatic fever, chorea, chronic tonsillitis, or scarlet fever, we have remaining a very small number. Most of these few remaining cases belong to the *syphilitic* type with aortitis. It is now thought that almost every one with syphilis has had some spirochaetal invasion of the myocardium, so that every patient with a history of syphilis or with a substantiated positive Wassermann reaction may be said to have potential heart disease. A great many such people, however, show no symptoms or signs of heart trouble, whether due to satisfactory early treatment or to a relative immunity to the disease. In such cases pregnancy and labor are well enough borne so far as the circulation goes, although of course premature delivery is a common occurrence. If, however, the rare case is found with definite signs of syphilitic heart disease generally accompanied by aortic regurgitation, the prognosis is poor, no matter what is done. In such cases life will probably be prolonged by abortion, but at best the outlook is gloomy.

The very unusual infection of the heart by pneumococcus, gonococcus, influenza bacillus, staphylococcus, or virulent streptococcus generally terminates in speedy death. The recovered case is rarely if ever recognized etiologically, and probably should be put into the rheumatic heart group prognostically. Such very rare conditions as tuberculosis, echinococcus invasion, or trypanosomiasis of the heart might occur once in the lifetime of an obstetrician, except in

South America, where cardiac trypanosomiasis is said to be common (in Brazil).

Rheumatic heart disease is the type almost invariably found in pregnant women, as illustrated, and it is this group, therefore, that will occupy most of our attention. The question in general, then, is resolved into one of prognosis in cases of rheumatic heart disease associated with pregnancy.

FUNCTIONAL CONDITION—THREE GROUPS IN RELATION TO PREGNANCY.

Of greater importance in the prognosis of a given case than either etiology or structural damage is the functional condition of the heart. There are two types of heart failure—*anginal* and *congestive*—but practically the only type which concerns us in dealing with the pregnancy age of women is the *congestive* type (since serious coronary sclerosis under 45 years is very rare). There are all grades of congestive failure, and these grades are variously classified for various purposes. It is enough for us to consider three grades in the problem before us.

1. Mild heart disease with little if any failure;
2. Severe heart disease with marked failure;
3. Doubtful cases of slight to moderate failure, present or impending, in which individual decisions must be made.

Cases in the first and second groups are readily eliminated; those in the former group being obviously competent are allowed to proceed without treatment; those in the latter group are treated radically with a view to termination of pregnancy by the gentlest means. How may we be helped in estimating the degree of present or impending failure in the doubtful cases of Group 3, where there is slight to moderate failure, and where individual decisions must be made? We cannot agree with those writers who have general rules for procedure in all these cases according to the degree of valvular involvement. It is not mitral stenosis *per se* that is of gravest danger, but this particular condition, being common in rheumatic heart disease, presents itself as a problem most frequently.

A careful cardio-respiratory history of the period before pregnancy is of prime importance in each of the doubtful cases. The symptoms to be particularly stressed are: (1) dyspnea, (2) palpitation, (3) cough, on slight exertion. *Progressive* weakness and ease of fatigue associated with demonstrable signs in the heart may be indicative of a weakening heart muscle. Of course, the record of experience during previous pregnancies is extremely valuable. Patients with organic lesion giving positive evidence of a weakened muscle in the past cannot withstand pregnancy and labor without some cardiac damage to themselves.

For those women with organic heart changes who give no past history of a tired muscle, we

need some reliable test of functional capacity. Have we one? White and Brittingham, after having investigated tests of cardiac efficiency, came to the conclusion that we have none which fulfil their promise. Failing such measure, we must resort to careful observation at frequent intervals during pregnancy with the hope of being able to reach a decision through the early discovery of, or through absence of, any new development.

True organic heart disease is found in probably less than one per cent. of pregnant women. Of this small number, many can be selected in which definite procedure should be advised, or in which all treatment is withheld. The remaining patients must be kept under strict daily surveillance and be treated promptly at the first appearance of failure symptoms. A few maternal deaths and more cardiac injuries can be avoided by early recognition of a weakening heart muscle and subsequent prompt action. We cannot eliminate all error, but we believe that fewer mistakes will be made in the face of more careful diagnosis and stricter classification.

PRESENT SERIES OF 102 CASES.

Our cases demonstrate very clearly the two features that we wish to emphasize most strongly: First, the importance of separating at the very outset the patients with organic heart disease from those in whom there is no disease or muscle insufficiency; and second, the relatively slight significance of specific valve injuries in relation to cardiac prognosis.

Among 102 consecutive cases referred for examination, 49, or 48%, had no organic heart disease; that is, it was impossible to demonstrate any structural change or impairment of cardiac function. These patients presented variously symptoms of palpitation, tachycardia, non-progressive weakness, and irritability. Such symptoms were generally associated with the presystolic murmurs at the apex or base, premature ventricular beats, and marked sinus arrhythmia. None showed diastolic murmurs. The diagnoses included in this group were: effort syndrome, irritable heart, and normal heart. On the strength of such diagnosis, they all were advised to proceed through labor without treatment or more than normal observation. Each one was delivered routinely without showing signs of cardiac damage. Disposing thus of those cases where no prognostic decision was necessary, we have remaining 53 which showed evidence of organic heart disease, and all were of so-called rheumatic origin.

STRUCTURAL DAMAGE.

The valve lesions found in this group can be enumerated as follows:

Mitral stenosis uncomplicated 36—or 68%;
Mitral stenosis and aortic regurgitation 10—or 19%;
Mitral involvement without demonstrable stenosis 5—or 9%;
Mitral stenosis with aortic regurgitation and stenosis 1—or 2%;
Pure aortic regurgitation and stenosis 1—or 2%;
Pure aortic regurgitation or aortic stenosis did not appear.

PROGNOSIS.

Deaths occurred in two patients, or 4%: in one, with acute endocarditis, superimposed upon a chronic infection (mitral stenosis and aortic regurgitation) and in one with auricular fibrillation in mitral stenosis. The former survived a vaginal Caesarean section at four months, but died at home one month later. The latter died a few hours after delivery. Thirteen cases, or 24%, were interfered with, either at the time seen or at term, by abdominal Caesarean section. Of those that were not interfered with, none died, but two patients with marked mitral stenosis in whom interference was advised, refused any operative procedure and passed through pregnancy to normal deliveries without cardiac failure. This observation brings up the natural question—"How many of the thirteen who did submit to operation would have been equally successful without interference?" and suggests the possibility that there is too much radicalism in the treatment of pregnant women with heart disease.

Cases of mitral stenosis *did* occur most often in those women who suffered most failure, but not oftener than the incidence of this lesion in rheumatic heart disease would warrant.

A word about the death rate in this series—which I hope Dr. Hamilton will elaborate. It is not accurate in the final analysis of heart disease associated with pregnancy in general—and for two reasons:

- (1) The cases seen were all ambulatory.
- (2) The records cover only the time up to the discharge from the Lying-In Hospital.

CONCLUSIONS.

We have found in this investigation—*first* that approximately 50% of pregnant women who present cardiac symptoms or signs have not organic heart disease,—*second*, that heart disease in pregnancy is almost invariably rheumatic in type, and—*third*, that individual prognosis must be based upon functional capacity rather than structural change.

NOTES ON THE PROBLEM OF HEART DISEASES IN PREGNANCY.*

BY BURTON E. HAMILTON, M.D., BOSTON.

DURING the years 1921 and 1922 I have had the opportunity to see and follow the cases suspected of having heart disorders admitted to the wards of the Boston Lying-in Hospital. As a logical outgrowth of looking after these cases at the end of pregnancy, a heart clinic meeting at regular hours in the outpatient pregnancy clinic was started a year ago. To this clinic are referred (1) all cases that show physical signs suggesting heart disorder in the routine pregnancy clinic examination; (2) those that complain of symptoms suggesting heart embarrassment, for instance, breathlessness, palpitation, orthopnoea, haemoptysis, or that have a history of such complaints in previous pregnancies, or during other physical strain; (3) those that have a history of rheumatic infections. The cases have been and are being followed by me in this clinic, and as conditions in the individual case indicate—through delivery and puerperium in hospital or home, and afterward. All those with definite heart disorders have been advised to go to hospital for delivery. In spite of this an occasional case demands a home visit.

Suitable cases after obstetrical discharge are referred for permanent care to the special heart clinics in the large general hospitals. But a fair number of cases continue to be obstetrical and heart problems after obstetrical discharge, particularly those that are awaiting sterilization. It is now a plan of the clinic to send for, after delivery, all cases of interest to the matter of heart diseases in pregnancy at stated intervals, 3 months, 6 months, a year, every year—for the sake of the statistics that only can be gathered this way.

Dr. P. S. Richards, a recent graduate of this hospital, attempted to follow up by house visits all the cases that were delivered in the Boston Lying-in clinic, and believed to have heart complications, from 1916 to 1920 inclusive. There were about 150 such cases. So far as can be estimated about half of these recorded cardiac cases did not have a significant disorder of the heart. This, of course, meant a great deal of lost effort in following up the series. Only 40 could be induced to return to the hospital. These I examined, and found sixteen of them to have no heart disease. A great deal of time and effort was expended by Dr. Richards, and the conclusions that can be drawn from his work, though of interest, are not sufficient to repay such labor. Hence the demand for a continuous follow-up of cardiac cases as they are discharged from the hospital heart clinic preferably in continuous charge of the same physician.

The clinic has consisted simply of myself, an attendant nurse, and the outpatient social service—without which last the clinic would collapse. The actual running of the clinic is a simple matter, the only apparatus used is stethoscope and sphygmomanometer. A spirometer has recently been added. A flight of stairs serves as an effort test. In a few cases special laboratory aids to diagnosis have been obtained through the courtesy of other hospitals, but these aids have not been essential, and it would not prove embarrassing to conduct this particular clinic without them. Records are kept on the regular obstetrical files, but also a small record of each heart case for quick reference in the clinic and to aid the social service.

The present system of caring for the heart cases at this hospital has evolved, as can be seen, directly from the demands of the work, and from the suggestions the actual work has afforded.

It seems that this work thus carried out should (1) (first and most important) afford a special group of the community's sick as satisfactory advice as can be expected; (2) specially train the cardiologist in charge in his part of the handling of patients with heart disease during and after pregnancy; (3) serve to accumulate trustworthy statistics on the subject, of which there are not enough to date.

Cases in this clinic are at all times under the direct control of the obstetrical staff. Treatment pertaining directly to the heart disease has naturally been given by me. All other treatment on these cases is determined in every way (interference or not, and if interference, when and how—sterilization, if when, and how) by the obstetrician, in the light of whatever information and advice the heart specialist can offer.

It is very doubtful if a heart specialist should ever definitely recommend obstetrical procedures for his patients, or choose the time for such procedures. Several times I have seen cases with which I was thoroughly familiar, from my point of view, given interference, or interference withheld on the judgment of the senior obstetricians, based on obstetrical considerations which I did not appreciate—a complicating toxæmia, for instance—when the choice did not agree with my unexpressed feelings. Open-minded observation of the results of these occasions has shown the limitations of special knowledge. A thought of the mass of interplaying indications for operative deliveries in general shows how ridiculous it is for a cardiologist to give advice on them. On the other hand, I have seen that an obstetrician does not know the true signs of heart failure and cannot differentiate them from insignificant signs. He is not familiar with the recognition, significance and treatment of the various disorders of the heart beat. And his patients sometimes have these things and they

*Read in part before the Boston Association of Cardiac Clinics at the Boston Lying-in Hospital, January, 1923.

are of significance. And it is not to be expected that any obstetrician can gather experience enough to treat women with heart disease through pregnancies unaided. Indeed I do not know an obstetrician who does not agree with this and act accordingly. The chief difficulty has been that the physicians who have had to pass on the heart problems have not armed themselves with special information on these particular matters. The choice of Caesarean Section, or an instrumental delivery from below after the first stage, actually comes up for decision in nearly every case with heart disease complicating pregnancy approaching term. The obstetrician who makes the choice obviously should and invariably does ask the heart specialist how the heart of the particular case will stand one or the other procedures. And it is clearly the duty of the heart specialist, who is in a position to be asked advice on these matters, to familiarize himself by actual observation—there is no other way—with the effect of these strains on diseased hearts. The choice of anesthetic is also usually referred to the heart specialist. It is a long, hard bit of work, and it is in a rather small and perhaps unproductive field.

Now there is little new in these ideas, and nothing that would not have been admitted years ago. The only new thing is that the medical profession is, for the first time, somewhat prepared to undertake to fulfill the more obvious requirements of the heart division of this problem—and others in the community. Recent broad advances in our whole knowledge of hearts has not perhaps brought the subject up to the level of the most perfected branches of medical science. It has for the first time stimulated many physicians to special work in heart problems. These have started special heart clinics in all medical centers—forty-odd in New York—six or seven here. Hence the heart clinic in this hospital—a similar one grown up simultaneously in the New York Lying-in Hospital and the Sloan Maternity Hospital—and hence this meeting tonight.

Rather than give a detailed report in this paper of the cases that I have seen in the last two years, I will briefly group them to give an idea of the extent of the problem of heart diseases in pregnancy.

1. About one per cent. of the whole clinic have significant disorders of the heart. And all but a very few of these are classified as cases with rheumatic heart disease.

2. About an equal number have systolic murmurs, or extra systoles, or complain of heart pain, palpitation, fatigue and breathlessness on slight effort. These two large groups are sent to the heart clinic.

(There are smaller groups, cases of paroxysmal tachycardia, a rare thyroidism case with

heart complications, etc., which I will not mention further here.)

None of group 2 has died, although oftentimes their noisy systolic murmurs, or their tachycardia and breathlessness on effort test and their stories of weakness and faintness have simulated dangerous conditions. I will not discuss this most interesting group because of the limits of space. It is filled with cases that can trouble the obstetrician, the patients and their families to a great degree when not courageously diagnosed. I have known of several instances where wrong heart diagnosis has resulted in similar cases in therapeutic abortion, honest but unnecessary.

Of group 1, within which about 45 are completed cases at this writing, that have been considered to have rheumatic heart disease, 7 are dead. These seven deaths occurred over an interval during which fifteen total maternal deaths are recorded in this hospital. So that the one per cent. of the clinic that have heart disease will surely furnish an appreciably large fraction of the total pregnancy deaths even though this percentage is not nearly so high, as is probable, as the above figures indicate.

Now probably an undue proportion of cases who appear dangerously ill to their private physician are sent to this hospital, as is right, and for this reason the cardiac death rate in this hospital will be to some extent raised artificially. One of these cases died from causes that would have been sufficient to cause death in a person without a handicapping heart disease. And I believe that from these 7 deaths out of 45 cases one cannot obtain an indication of the probable percentage death rate in rheumatic heart disease in this clinic, by any manipulating of figures. But a number of the heart cases who have not died have developed failure and have been in extremely dangerous condition. And no one could have followed these cases and not realize that it is dangerous for a woman with heart disease to go through pregnancy.

I will cite a few cases—cases that did not die and, therefore, in a statistical maternal mortality report would be classed as “successful.”

- (1) A woman of twenty-four, rheumatic fever in childhood, no further significant illnesses, led a normal life without evidence of handicap from her heart disease, became pregnant shortly after marriage $1\frac{1}{2}$ years ago, developed heart failure at between seven and eight months, was admitted to another hospital where she went into labor and was delivered of a baby which lived one day. She has been in hospital one-half the time since then. She has been unable to take any charge of her home. She has mitral stenosis, auricular fibrillation (this began during her pregnancy) and chronic heart failure.

- (2) One of her three sisters has rheumatic heart disease and is a member of this heart clinic. She has been delivered nine times, one child

died a few days old with a diagnosis of congenital heart disease; another, aged six, has chorea and heart disease—the mother had acute heart failure directly after her last confinement (she was in bed more than a month before delivery, and under considerable restriction before this) and is now alive living on a distinctly lower level of activity. (3) A woman of 34, para III; rheumatic fever in girlhood; no significant infections since then; mitral stenosis, leading a normal life, reported to the clinic at six months. She had had haemoptysis for several mornings and no other signs of heart failure. She was admitted to the hospital; she did well for six weeks, her haemoptysis stopped, but returned and she then gradually developed orthopnoea and clean-cut heart failure, in spite of being in bed. She went into labor and was delivered from below after a short, easy first stage; remained in heart failure and was extremely sick for several weeks; was several weeks more getting up and about the ward; went home to an invalid's life, which continued for three months. Since then she has "felt as well as ever." The weight that pregnancy, uncomplicated, without any removable strain, can bear on a rheumatic heart is illustrated well by this unusual case.

The above cases serve to point several considerations which are not all of them commonly appreciated.

Not only—1. The danger of maternal death, but

2. The possibility of enforced invalidism through the latter part of pregnancy and thereafter, though with final recovery.

3. The possibility of surviving the pregnancy but being permanently partially disabled thereby.

4. The chance of losing the child after a full term pregnancy, whatever the outcome for the mother.

5. The possibility of bearing children who will have rheumatic heart disease. (The family incidence of rheumatic heart disease has been strikingly shown by Dr. St. Lawrence of New York recently, and the subject is receiving the curious attention of all of us who are interested in the matter of prevention of heart disease.)

These appear as intensely practical and interesting problems for further investigation in this and similar heart clinics.

Now it is certain that many women with heart disease would elect to risk all the dangers for the chance of breeding successfully. And it is certain that many women with rheumatic heart disease have bred successfully. It is also certain that most women with heart disease enter pregnancy without knowing their chances for success, and that many would not take the chances if they knew them.

I feel that those of us to whom women are to

come for advice on the subject should give it based on all the above considerations.

Clearly the solution we could all desire is a standard for classifying women who have diseased hearts, so that one can tell before or early in pregnancy those who will succeed from those who will fail. Now from what we know of rheumatic heart disease we can and do group these women by standards such as (1) evidence of heart function in the light of the history—the degree of physical strain they have endured. (2) Their present evidence of extent of heart damage and function on direct examination and by effort test. (3) And modify these findings somewhat by considerations such as their home conditions, accessibility to hospital and so forth. Such considerations as any clinician gives to every clinical case.

And we are left with two groups—one that has a relatively poor prognosis—one that has a relatively good prognosis.

I wish to protest vigorously against any suggestion that one can do more than select cases whose chances are *relatively good*. Sir James Mackenzie in his book on heart diseases in pregnancy suggests that one can do more. I have already known several cases who developed severe heart failure and have seen at last one such case die, cases who had highly skilled obstetrical treatment, and who by all of Sir James Mackenzie's standards and by all such standards that I have heard of were safe risks.

From what we know of pregnancy and of rheumatic heart disease it can readily be seen that only one of the many contributing causes of failure and death in heart diseases complicating pregnancy can be foretold or measured to any extent—namely (1) heart failure from mechanical overstrain. And a thought will show that even this cannot readily be measured. Many a heart endures one uncomplicated pregnancy and fails under the weight of a later pregnancy. Furthermore, the strain of any pregnancy may include not only the purely mechanical strain, but possibly a complicating toxæmia with its direct and indirect burden to the heart.

And all of us who deal with rheumatic heart disease know that (2) heart failure comes to patients with heart disease often as the result of intercurrent infection—a tonsillitis or respiratory tract infection. (It already is noticeable to me in this clinic as it is in the community at large that many cardiacs suffer severely when there is an epidemic infection abroad—and these epidemics of varying extent and virulence come and go; they are inevitable. This has so impressed me that I wonder if the single most important thing in the prognosis of a case of rheumatic heart disease complicating pregnancy is not the unpredictable question of whether she will catch influenza or grippe when near term.) And to these possible infections is added the unpredictable risk of the infections of childhood

Sir James Mackenzie stresses another unpredictable occasional cause of failure himself (3) the onset of auricular fibrillation in a damaged heart. (4) Emboli occur occasionally from intercardiac thrombi.

In connection with this subject, Dr. Franklin S. Newell* states, in effect, "I believe that there are no accurate means of determining the effect of pregnancy on the given heart." "I can recall several instances in which the results both good and bad"—were—"widely at variance with the opinions expressed by competent internists after careful study." In his experience, "In two patients with an apparently equal degree of cardiac damage," "compensated under normal conditions," "one will develop more or less serious symptoms during pregnancy and labor, while the other will pass through the strain without developing any unfavorable symptoms."

SUMMARY.

Recent increased interest in heart problems has stimulated the development of special heart clinics in a number of lying-in hospitals in various medical centers. One at the Boston Lying-in Hospital has been in operation nearly two years. Suitable cases are watched in this clinic through pregnancy, delivery and puerperium and systematically followed up.

About 2 per cent. of the whole clinic is referred to the special heart clinic. Half of these have rheumatic heart disease. This 1 per cent. of the total clinic contributes a significant fraction of the total deaths of the hospital.

From direct observation of these cases it appears that a patient with rheumatic heart disease presents an appreciable risk of:

1. Maternal death. 2. Prolonged disability before and after delivery with recovery. 3. Permanent disability. 4. Loss of child. 5. Bearing a child who may develop rheumatic heart disease. (This last risk is one to which attention has only recently been directed; present data suggest that it is an important consideration.) Prolonged observation in this clinic of a long series should enable us to measure these risks more accurately than we can now estimate them.

The heart clinic can divide cases with rheumatic heart disease into: 1, cases with a relatively poor prognosis; 2, cases with a relatively good prognosis. Already several of the second group have developed heart failure and one has died, cases that from all standards appeared favorable risks. This serves as an emphatic protest against suggestions that one can confidently select cases of rheumatic heart disease complicating pregnancy that will go through successfully.

The nature of rheumatic heart disease and of

*"The Treatment of Pregnancy and Labor Complicated by Cardiac Disease." Franklin S. Newell, M.D., Transactions of the American Gynecological Society, 1920.

pregnancy forbids precise prediction. The former allows for heart failure from (1) mechanical strain; (2) intercurrent infections; (3) sudden disorder of the heart beat. And for an occasional sudden death from (4) emboli of intracardiac origin. The latter gives opportunity for unpredictable complications particularly dangerous to cardiae, namely: (1) difficult labor (not always predictable), (2) infections of childbed, (3) toxæmias.

I wish to thank the members of the staff of the Boston Lying-in Hospital for their courtesy and continued assistance to the work of the heart clinic in their hospital.

DISCUSSION.

DR. F. S. NEWELL: The question of pregnancy and labor in women who have had rheumatic heart disease is of great importance. The strain imposed on the heart by the extra work thrown on it during pregnancy and at the time of labor is a serious matter, both in the immediate present and in the more or less remote future. There can be no question but that if a patient who has had a previous cardiac infection asks as to the advisability of pregnancy, the most conservative answer must be that pregnancy and labor entail considerable danger. A certain number of patients who are apparently good risks go to pieces during pregnancy, even under careful observation and either die or are left as cardiac invalids, and it seems evident that the conservative reply to a patient who asks about the advisability of pregnancy must be that the heart will suffer more or less damage from the extra burden thrown on it, which may be immediately serious or even fatal, or may simply shorten the patient's life to an extent which cannot be determined in advance.

If the patient feels that the joy of life is so seriously interfered with by not being able to have children as to warrant taking a risk, the seriousness of which cannot be definitely stated, she is justified in doing so if she has had no previous decompensation, as long as she understands first that her life will be shortened to some extent under the best conditions, and second that it is possible she may either die during pregnancy or be left a cardiac invalid and not have a baby to show for it, since interference with the pregnancy may become necessary at any time.

Patients who have had a previous break in compensation should be strongly advised against pregnancy in any case.

Most patients come to us, however, with the pregnancy an accomplished fact. In these cases the pregnancy should be carefully watched. Going over the stairs, hill climbing, etc., should be interdicted. The diet should be carefully regulated. The patient should be put on a routine of two hours a day and one day a week in bed throughout the first seven months of preg-

nancy, even though she shows no symptoms, and at least two days a week in bed during the last two months. Any sign of failure of compensation should be met by absolute rest in bed.

Labor should be conducted in the easiest possible manner. In primiparae I believe Cesarean section is the best method of delivery. In multiparae an easy first stage terminated by forceps as soon as the cervix is dilated seems to offer a conservative method.

If compensation fails during the first six months of pregnancy, the most conservative method of treatment is to insure absolute rest until compensation is reestablished and then to terminate the pregnancy; the best method, in all probability, being by abdominal abortion and sterilization, to guard against future pregnancies. If the attempt at restoration of compensation fails; abdominal abortion under local anesthesia is the safest method.

If compensation fails in the last three months of pregnancy, an attempt should be made to prolong the pregnancy up to a point which will insure a living child, unless the patient's condition is so serious as to demand an immediate delivery, and pregnancy should then be terminated by Cesarean section and followed by sterilization.

I am willing to admit that this method of treatment is apparently unnecessary in many cases as far as can be judged from hospital records. In other words, the great majority of patients live through a pregnancy conducted on less radical lines, but I believe that we should be interested not only in the outcome of the present pregnancy but in the patient's future, say 10 or 15 years hence, and I feel that the more we can lessen the strain on the heart during the individual pregnancy and labor, the less will the cardiac reserve be exhausted, and the active life of the patient will be prolonged to a corresponding degree. It is equally important, in my opinion, to preserve the health of a patient so that she may be able to care for her child or children 10 or 15 years hence as it is to bring her through the immediate strain alive, and I believe that the treatment which I have outlined will prove the most satisfactory in accomplishing both objects.

DR. FOSTER S. KELLOGG: The interesting papers of the evening have brought forth many points for discussion on the question of rheumatic heart disease complicating pregnancy and labor.

I will take up a few of these points as they have occurred to me in listening to these papers.

The first is that I am convinced, as I was several years ago when I wrote a paper on this subject, that we are still far from knowing all there is to know about the subject. I believe that only with a very close study of a large number of cases in pregnancy clinics run under the same roof with lying-in hospitals will it be possible

for us to decide the best handling of rheumatic heart disease complicating pregnancy. The amount of material seen in the private practice of any one man is too small to give just conclusions. As I pointed out in my paper several years ago, there are divergent sets of ideas held regarding the danger of valvular heart disease in pregnancy. On the one hand, the Continental school and some American obstetricians, notably Hearst, hold that it is not a serious complication in pregnancy. On the other hand, the bulk of Americans—and our cardiologist here has shown this point of view in his paper tonight—believe it to be an extremely dangerous complication of pregnancy. Personally I hold ground between these two ideas. Dr. Hamilton's statistics given us tonight as to the maternal mortality are extremely high, so high that it is not an unfair statement to say that if they are accepted a woman having rheumatic heart disease runs too great a risk to be allowed to attempt pregnancy. My statistics, published in 1917 from all cases to that time at the Lying-In Hospital, show the maternal mortality as high or higher than his 45 per cent. That figure, if accepted without argument, would force us to this same conclusion, namely, that no woman with rheumatic heart disease had a right to undergo pregnancy. Analysis of my own figures show first that all the patients in this series were decompensated at, or nearly at, the time of labor. Second, that they had no prenatal care whatever. Third, that they were badly handled from an obstetrical standpoint in many instances. I, therefore, discount these figures very considerably for the purpose of comparison with cases well selected and followed from the beginning of pregnancy. Regarding Dr. Hamilton's statistics, though they point out very conclusively that many patients die who have cardiac disease and become pregnant, nevertheless, many of them died of other things, not cardiac disease, in the series; and a still more important point, to my mind, is that all but one of the cases dying were multiparae. In other words, practically all had survived a single pregnancy with heart disease. As a result of this I still persist in the feeling, since childbirth and the possession of even one child is of tremendous importance in the lives of most women, that there is a great group of rheumatic heart disease cases which should be allowed to essay a single pregnancy, and if this pregnancy is successful that further pregnancy should be interdicted with voluntary sterilization if desired. How to select this group appears to me to be the main work of the cardiologist, and I am disappointed as I am told that this selection is not possible; and I still hope that by a careful study of a great group of cases that it will become so with a fair degree of accuracy.

Modern cardiology seems to me to have blinded us a little in its early enthusiasm for newer discoveries to the fact that still the bulk of all cardiac complications which occur in heart dis-

ease complicating pregnancy is mechanical failure. Since this is so and since the signs of mechanical failure are readily observed, it seems to me that where the patient is an inactive cardiac and has no previous history of decompensation, one is justified in carrying the patient to the point where these signs demonstrate early cardiac failure, and that then failing to keep the patient ambulatory (as suggested by Lawrence), we can still deliver our patient with a very considerable degree of safety to her; this always providing that she is having the most careful watching so that we may detect the early signs of decompensation at the first possible moment. It must be pointed out in this connection that no hospital patient, no matter how well organized the pregnancy clinic, can get the same care that a private patient, carefully watched by the cardiologist, can have, since in the one case the patient must come to the clinic, and in the other the doctor can go to the patient. Two things regarding the obstetrical treatment of these patients: First, that I still believe either the choice of anesthetic in the majority of cases rather than local anesthesia with scopolamine and morphine. My reason for this is that if the patient is not decompensated at the time of delivery, she stands either perfectly well, whereas if she is decompensated and delivery is to be by abdominal section the added length of time taken by operation under local anesthesia more than compensates for the believed safety of the anesthetic. Second, I do not believe in private practice,—though in hospitals there are arguments for it,—in opening the abdomen and doing an abdominal abortion because one wishes to sterilize at the same time. I believe it is safer to abort the patient from below and then if sterilization is desired to do it subsequently. If abdominal abortion is done for sterilization, I believe it is a safer procedure for the patient to do a hysterectomy than to open the uterus and tie off the tubes. It seems to me that when you do an abdominal abortion for the sake of sterilizing the patient at the same time, you are causing the patient the unnecessary risk of Cesarean simply for the sake of doing the sterilization and that you perhaps multiply her risk 100 per cent. over the risk of aborting her from below and sterilizing her subsequently.

DR. C. H. LAWRENCE: In estimating the ability of a patient with a damaged heart to stand the strain of pregnancy and labor, there are two important points which I think have not been mentioned. The first of these is the ability of the patient to cooperate with the physician intelligently. A certain number of patients do badly, not because of their cardiac condition, but because they have not enough intelligence to understand what the physician wishes them to do.

Given two patients whose cardiac function is equal, one will do well and the other badly ac-

cording to the amount of intelligent care they use in avoiding unnecessary fatigue.

In determining whether or not a patient with a damaged heart should attempt to go through pregnancy and labor, it is important to find out whether she is equipped mentally, and of course financially, to spare herself as much as may be necessary. If she is not, the risk of pregnancy becomes immeasurably greater.

The second point I wish to make is that in estimating the ability of a heart to stand strain, it is important to know how much strain it has already been made to stand and how successfully it has done this.

Some patients when first seen have hearts which are behaving badly, not because the heart muscle itself is badly damaged but because it has been abused. Such hearts may be amply able to meet the strain of pregnancy if the abuse is eliminated.

The factors which have brought any heart to the condition in which it is found at the time of examination can be obtained only by taking a careful, exhaustive history, and I wish to emphasize this proceeding as one of the most valuable methods of estimating the ability of the heart to stand strain, the amount of extra strain to which it will probably be subjected, and the ability of the patient to cooperate intelligently with the physician.

DR. PAUL D. WHITE: The chaotic condition of medical opinion regarding heart disease and pregnancy in the past may be illustrated by two groups of statistics obtained from the literature. The percentage of heart disease in pregnant women has been variously estimated from 0.1 per cent. up to 60 per cent. and the mortality of pregnant cardiac patients has been variously put at figures ranging from 3 per cent. to 61 per cent. In both cases, without any question, the extremes are a long way from the truth, but the lower figures are quite certainly more accurate than the higher. In the absence of a large amount of accurate statistical material we cannot be at all certain of the true percentages either of heart disease in pregnancy or of the mortality of pregnant cardiac patients. If we consider, however, that the frequency of heart disease in the community ranges from 1 per cent. to 2 per cent., as has been variously stated by fairly accurate observations in recent years, we may say that the percentage of heart disease in pregnancy is probably less than 1 per cent., since without much question a good many women with heart disease are not allowed to marry. The other figure of the mortality in heart disease in pregnancy probably should be put, from available figures, close to 10 per cent. Dr. Hamilton considers that with care this mortality may be reasonably reduced to 5 per cent. but not much below.

There has thus been astonishingly little accurate data in the past with regard either to the frequency of heart disease in pregnancy or with

regard to the kind of heart disease or to the mortality. Such work as has been started here in the Boston Lying-In Hospital through the institution of Dr. Hamilton's Cardiac Clinic promises much for the future; in fact, work like this, if extended throughout the country, would at last give us in the course of years accurate statistics which at the present time are almost wholly lacking. The work which Dr. Breed and I are reporting, begun some two and a half years ago, was one of the first attempts to classify accurately pregnant patients with heart symptoms and signs. This at the outset is obviously of great importance. It is simply the beginning, however, of a large amount of work which should be carried on in the future. Prior to the present coöperation of internists familiar with heart disease, and obstetricians, there has been only one medical observer the record of whose personal experience can be regarded with great respect by both internists and obstetricians. That man is Sir James Mackenzie, who carried on for many years an obstetric practice while he was developing expert knowledge of heart disease. He has written a book on heart disease and pregnancy, in which can be found some of the results of his experience. Of course his observations were necessarily often rather crude and simply a guidepost for further work. He was a pioneer.

Little has been said this evening concerning cardiac arrhythmia and pregnancy. A few words on this subject are worth while. First, sinus arrhythmia, which is the commonest type of irregularity of the heart, is of no importance. Patients with sinus arrhythmia are normal enough and, in the absence of heart disease, should not be in any way a problem. Usually sinus arrhythmia can be diagnosed; if in doubt, sinus arrhythmia can usually be determined by the effect of forced respiration on the pulse. Premature contractions, which constitute the next most common type of arrhythmia, are also unimportant in the absence of heart disease. Mackenzie has written concerning premature beats as follows: "So far as pregnant women are concerned I found extra-systoles present in 50 per cent. of healthy cases. Usually they occurred at rare intervals and their detection was often accidental. Occasionally they were of frequent occurrence. In all cases the pregnancy was completed and the confinement passed with no trouble. I have in addition followed many of these women for twenty and thirty years, and the results justify this view." The next most common type of arrhythmia is auricular fibrillation. This, however, is extraordinarily rare in pregnancy. Mackenzie himself has seen only half a dozen cases in his experience. He writes as follows on the subject: "My experience of pregnancy in women with auricular fibrillation is limited to half a dozen cases. This may seem a small number, yet if it be considered that these cases occurred at a time when I had a midwifery prac-

tice of forty or fifty confinements a year, it will be seen that altogether there must be a considerable number. All my cases gave a history of rheumatic fever; all had mitral stenosis. In each case the advance of pregnancy was accompanied by increasing signs of heart failure—limitation of effort and oedema of the lungs as already described. In all but one premature labor set in between the sixth and seventh months. All lived through the confinement, but none ever recovered the same degree of health as was enjoyed before the pregnancy. I actually saw one patient in two pregnancies. She made a fair recovery. In the others heart failure increased gradually till they died within two years of the pregnancy.

"Judging by my own experience, I believe that though pregnancy does not produce an immediately fatal heart failure, it so weakens the organ that it hastens the fatal issue. In saying this, I recognize that my experience is limited. At the time at which five of these cases were under my care I had not recognized the nature of auricular fibrillation, nor had I learned how to give digitalis in this condition. In the one case which occurred after I had acquired this knowledge, I think I was able to help. The matter, however, requires far more investigation than I have been able to undertake. I leave it here, trusting that others, fortified by the knowledge now available, will carry out a more thorough inquiry.

"In the meantime I would lay it down that auricular fibrillation is a bar to pregnancy. Should pregnancy have occurred, careful observation of the patient must be maintained. If the pulse rate exceeds 80 when at rest, digitalis should be given and continued until the rate falls to between 60 and 70 per minute. If oedema of the lungs, orthopnoea, or enlarged liver supervenes, the pregnancy should be terminated forthwith."

Other authors more recently have written on the seriousness of auricular fibrillation in pregnancy. The only case that we had in this present series with auricular fibrillation died. To be sure, it is possible to control the ventricular rate in auricular fibrillation by digitalization, but at the time of labor it is true that even a digitalized heart with auricular fibrillation may have, as a result of sympathetic stimulation, a tachycardia and do badly.

Paroxysmal tachycardia, not very common, may be dismissed probably in much the same way that premature beats have been; that is, in itself paroxysmal tachycardia presents practically no problem. Auricular flutter, which is much rarer, should probably be classed like auricular fibrillation. Heart block, which is rarest of all, is, if not the result of digitalis, a serious abnormality of the heart beat. Finally, pulsus alternans, the most serious of all abnormalities of cardiac mechanism, will be found very rarely in pregnancy, and when it is found is of course

a sign of extreme gravity, showing the presence of myocardial exhaustion. We have had no case in our series.

Because of the frequency of effort syndrome and symptoms of nervousness, it is without question true that in the past many of these cases have been grouped as cardiacs and so have helped to confuse the issue and have made many of the statistics collected in the past of little value. Effort syndrome in itself is no bar to pregnancy. Concerning this Mackenzie has written: "The condition in short is not due to disease of the heart, though it may be associated with disease, as, for example, mitral stenosis. It is due to some agent which increases the excitability of the whole nervous mechanism of the heart. Pregnancy can safely be undertaken by these people. It often does them a great deal of good."

A further observation should be made concerning the progress of patients with rheumatic heart disease and mitral stenosis after pregnancy. Dr. Newell and others have thought that there is distinct shortening of life as a result of pregnancy in these people, but it must be remembered that rheumatic heart disease with mitral stenosis tends generally to have a progressive downward course although often very slow. We all know that it is rare for patients with mitral stenosis to survive to old age, and this is just as true of men as of women. Even without pregnancy women with mitral stenosis tend gradually to show greater and greater cardiac disability as they get older, and although of course pregnancy and labor are a very definite strain, it is without doubt difficult to say whether or not the life of these people is much, if any, shortened by going through this strain.

Finally, it has been brought out tonight by this investigation of Dr. Breed and myself that almost the sole etiological factor in the production of heart disease in pregnant women is rheumatic fever (and allied infections). This almost invariably results in mitral stenosis, so that the problem of heart disease in pregnancy is mainly reduced to the problem of mitral stenosis in pregnancy. Mitral stenosis is of all grades, sometimes so slight that it is hardly to be diagnosed. Generally speaking, the less the stenosis, the more favorable the prognosis, and certainly, viewing the subject from this point of view, one cannot by any means say that mitral stenosis is a bar to pregnancy. If mitral stenosis is a bar to pregnancy then practically no woman with heart disease should be allowed to become pregnant. Of far greater fundamental importance than the study of the management of pregnancy and heart disease is the prevention of heart disease in pregnancy. The eventual success of the attack which is being inaugurated in this city as in others of this country against rheumatic fever is the most important measure to wipe out almost in its entirety the problem of heart disease in pregnancy.

INFECTIOUS COLITIS.*

BY HENRY F. HEWES, M. D., BOSTON.

Twenty-seven years ago, when I was a house officer at the Massachusetts General Hospital, a patient was brought to my wards suffering from a very severe disease of the intestine. Two weeks before his entrance to the Hospital, he had been taken with a sudden attack of excessive diarrhea. This diarrhea had continued ever since, with ten to fifteen loose stools daily. The stools contained, according to the report of the patient and his physician, much blood and slime, often clots and masses which looked like broken-down tissue. With the diarrhea there had been a considerable fever, rapid pulse, increasing prostration and weakness, and loss of flesh. There was some soreness of the abdomen but no pain except at the time of a bowel movement.

At the time of his entrance to the Hospital, the patient showed great prostration, temperature 101, pulse 120, and very small in character; white count 17,000. There was marked tenderness over most of the abdomen, especially along the course of the descending colon. The membrane of the rectum was diffusely reddened and oedematous with small bleeding areas. The stools were liquid, small in quantity and contained blood, mucus and pus, also numerous bacteria. The bacterial content of the feces appeared to be made up of all varieties of bacteria common to feces,—streptococci, staphylococci, colon bacilli. No tubercle bacilli were found, and no amebae coli.

During the patient's stay in the hospital, the diarrhea continued unabated, the prostration increased, and three weeks from the time of his entrance he died. Postmortem examination showed the walls of the colon from rectum to ileo-cecal valve much thickened and oedematous. The membrane throughout was engorged with many bleeding points and many definite ulcerations, some of large size. The rugae were smoothed out and effaced. The colon contained clots and masses of pus, blood and broken-down tissue. No evidence of malignant disease or tuberculosis was present. There was no evidence of any other pathological condition in the body. The patient, a man of thirty years, according to his story had never been ill since childhood until the advent of this disease. It had come out of a clear sky and killed him in five weeks.

This was the first case of acute infectious ulcerative colitis that I had ever seen.

Since that time I have seen many cases of infectious colitis, among them a considerable number of cases of this same fulminating type described in the case just cited.

In the study of the disease, I became convinced at an early stage of the serious nature of

*Read before the Suffolk District Medical Society, February 28, 1923.

these severe cases of the disease and of the total inadequacy of the ordinary methods of medical treatment to control the condition. Failing after much investigation to find a method of medical treatment which proved adequate in the control of the condition I resorted to surgical treatment in the care of the disease. In this treatment, we have found a method which will, if applied in time, at least stay the progress of the disease, save the life of the patient, and allow him to live in comparative health.

And it is to emphasize the value of surgical treatment in the care of these cases and the importance of the early recognition of the existence of the severe type of colitis in any given case, so that surgery may be efficiently employed, that I am presenting this paper.

The disease, variously described as infectious, or idiopathic, or ulcerative colitis, is an inflammation of the mucous membrane of the colon due to bacterial invasion. The actual nature of the genesis of the disease is not very definitely understood. In some cases, the disease appears to be grafted upon a previous specific dysentery, the Shiga or Flexner bacillus, or the amebae coli, having disappeared leaving an inflammation carried on by mixed infection of the ordinary bacteria of the intestine.

In some cases the colitis appears definitely as the sequel of some infectious disease, as measles, diphtheria, pneumonia, influenza. In other cases, the disease appears to occur as a secondary associate of debility and ill health, in people run down from overwork, or people in a poor condition of nutrition, the condition of lessened resistance seeming to have provided an opportunity for the bacterial invasion of the colon. In other cases—and this is the rule in cases of the very severe acute fulminating type of the disease—the condition appears as an idiopathic invasion of the colon, in individuals in perfect health.

The condition, whatever its genesis, appears as an acute inflammation of a part or the whole of the mucous membrane of the colon, with engorgement and oedema of the tissues, profuse exudate, and in more severe cases with actual ulceration of the membrane.

The cardinal symptoms of the disease are active diarrhea and prostration. There may or may not be abdominal pain and soreness. Nausea and vomiting may be associated with the onset of the disease. Fever is as a rule present at the start, though this is not always the case, this feature depending upon the severity of the invasion. Leukocytosis is present in active cases. Marked prostration and toxicity are often present from the onset, but in some cases this is not a marked symptom at this stage, the only disturbance being the profuse diarrhea.

The stools are, as a rule, after the initial clearing out, small in quantity and very loose in character, and consist of mucus, pus and blood,

mixed with ordinary fecal material. Blood is not always apparent to the eye, but a positive chemical test for blood is almost always present.

The bacterial content of the feces consists of the bacteria normally formed in the intestinal contents,—streptococci, staphylococci, colon bacilli, gas bacilli. No specific bacteria, as the Shiga bacillus, the tubercle bacillus, and no amebae are present.

Proctoscopic examination of the rectum and sigmoid shows a diffusely reddened membrane, swollen and edematous, with much exudate, often with small bleeding points apparent.

Diagnosis is made by the proctoscopic examination of the rectum, and the study of the stools. The proctoscopic finding showing the diffusely reddened membrane is absolutely diagnostic of the existence of a colitis. This fact having been established, the only further fact to determine is whether we are dealing with some specific form of colitis as dysentery, or tuberculosis, or with an idiopathic colitis. This matter may be determined by the examination of the stools. If Shiga or Flexner bacilli are present, or if amebae are present, we are dealing with a dysentery. If tubercle bacilli are present, we may have a tubercular colitis. In the absence of these specific organisms we can, if the proctoscopic finding is that of a colitis, make a diagnosis of infectious or idiopathic colitis.

The cases of infectious colitis may be divided into three groups:

- (1) Cases of acute colitis of moderate severity;
- (2) Cases of acute fulminating ulcerative colitis;
- (3) Cases of chronic or recurrent infections or ulcerative colitis.

We have first, the cases of acute colitis of moderate severity, running from one to three or four weeks, which get well under regular methods of medical treatment. This is the most common form of infectious colitis. This group includes most cases of definitely secondary forms of colitis, as the colitis associated with or following conditions of infectious disease elsewhere in the body, as measles, diphtheria, pneumonia, influenza, and many cases of apparently idiopathic colitis, cases of acute colitis where the colon appears to be the only organ in the body affected.

Some of the cases of so-called infectious diarrhea seen in infants and children belong to the group, though some are of course real dysenteries. All of these cases present the regular clinical picture of colitis, with diarrhea and stools containing mucus, pus and blood, either clear blood or occult blood, and a reddened mucous membrane with exudate is revealed by proctoscopic examination. Fever and toxicity may be present in varying extent. The duration of these cases of colitis of moderate severity va-

ries with the case and with the promptness and thoroughness with which proper treatment is administered.

Treatment consists of an initial dose of a saline cathartic, as magnesium citrate, or magnesium sulphate, followed by continued colonic irrigation with salt solution, three or four times a day. No food by mouth is given for twenty-four hours. Then a diet of lean meat, gruel made from wheat cereal, and twice baked bread without butter is given.

Subgallate of bismuth, a teaspoonful three times a day, may be given, though many cases do quite as well with the irrigation alone. I have used one per cent. solution of silver nitrate for irrigation intermittently with the salt solution irrigation in some cases with apparent success, but many do perfectly well with the salt solution.

Under this treatment, with complete rest in bed, cases should improve greatly within one or two weeks, if the treatment is started at an early period of the disease.

Where one of these cases having all the evidences of an existing colitis, in the appearance of the mucous membrane of the rectum and sigmoid, fails to improve under proper treatment in the course of two to four weeks we may suspect that we are dealing with a severe form of infectious colitis, an acute ulcerative colitis. Once we are convinced of this, a prompt change from medical to the surgical treatment required in this type of disease should be made.

The second form of infectious colitis, acute fulminating ulcerative colitis, usually shows evidence of the existence of a severe type of the disease from the very start. The diarrhea is severe, much blood is present in the stools, there is marked prostration, the mucous membrane shows evidence of very acute inflammation, with diffuse reddening and enlargement, and the presence of many bleeding points or small ulcers.

The disease continues on a fulminating course and does not abate perceptibly under the exploitation of medical treatment and death may occur in the course of a few weeks. The etiology of this form of colitis is as far as known an invasion of the mucous membrane of the colon by bacterial infection, just as is the case in the milder cases of the disease, already described. It is apparently merely the existence of a more severe invasion, or of a less resistant condition of the system and tissues to invasion, which determines the advent of the severe form of the disease, as compared with the milder form.

The pathology is simply that of infectious colitis. There is a more marked inflammation of the membrane, more destruction of tissue, more ulceration and bleeding than in the milder forms, but the difference in the condition present in the two types of case is only one of degree. All cases of severe ulcerative colitis do not begin in fulminating form and cannot be

distinguished from the milder type until the condition progresses, or the failure of the condition to yield to medical treatment proclaims it to be of the severe type.

The treatment of acute fulminating ulcerative colitis is surgical. It consists, in the first instance, at all events, of an ileostomy. The colon thus freed from all faecal contents is then irrigated regularly with salt solution. This treatment will, as a rule, if given early enough, check the disease. Gradually the colon heals, the blood disappearing from the discharges from irrigation, the prostration disappears and health and strength are regained.

This surgical treatment may not appear as an ideal remedy since it necessitates the continuance of an artificial opening in the intestine for a considerable period or perhaps permanently.

Since, however, the disease is apt to be fatal without it, and it does restore the health of the patient, it should be employed in all cases, and employed at an early date. It does not relieve all cases. Some, especially those where the use of surgery has been too long delayed, die in spite of it. In some cases where ileostomy fails to check the disease, the more severe operation of colectomy has to be resorted to.

The third type of infectious colitis is that of chronic or recurrent ulcerative colitis.

These cases of chronic colitis may represent cases of acute colitis which, surviving the initial attack, run on as chronic cases. A common history in such cases is the following: The patient has an attack of acute diarrhea with fever, perhaps chills and prostration, with ten or more daily loose movements containing often blood and mucus. The trouble gradually subsides, the number of movements falling to four or five a day, the fever and prostration disappearing. Sometimes the diarrhea ceases entirely for a period of a few weeks, to recur, however, at frequent intervals. The patient goes on with a continuous or recurrent diarrhea, enjoying fair health at times but gradually losing in strength and nutrition.

In other instances these chronic cases represent cases which, having at the start an acute colitis of apparently the milder type, which yields readily to treatment, get entirely well and remain so for months, only to have recurrences of the colitis at intervals. This is the chronic recurrent type of the disease. The disease may be mild in the first instance and very severe in some recurrence. I have known cases to recover promptly from one attack, and six months later have an attack which was fatal.

Some cases of chronic colitis have no record of any acute attack, but start and continue as cases of mild type, without fever or severe prostration, having chronic diarrhea continuously or in recurrent spells in spite of treatment over long periods of time. Many of the chronic cases which I have seen have had a history of more or less trouble with the bowels for periods of

two, four or even ten years, the proctoscopic examination showing always some evidence of the existence of a colitis.

These chronic cases differ from the other types of colitis already described, the mild acute colitis, and the acute ulcerative colitis, only in their course. In the severe cases, the findings in the membrane are similar to those present in severe acute ulcerative colitis, diffuse reddening and engorgement, with many bleeding points or actual ulcers. In the less active cases, we do not have the intense engorgement with active bleeding, but a dull red or mixed red and white membrane, often of granular appearance, sometimes covered with small red areas which look like purpuric spots or healed bleeding spots.

The x-ray findings in infectious colitis are not, as a rule, of importance in connection with diagnosis. The characteristic finding is an absence of haustration over the whole colon, or over part of it. Sometimes where an old ulceration has caused some constriction of the colon, a point of obstruction may be determined by x-ray. As a rule, however, the barium passes very easily and rapidly through the colon.

There is, as you know, another form of chronic colitis known as mucous colitis, a much more common disease than chronic infectious colitis. This is an entirely different disease, clinically, pathologically, and therapeutically considered, and must not be confused with the condition which I am considering. It is possible that the two diseases do sometimes run into each other, or that a disease may begin as mucous colitis and later become an infectious colitis. As a rule, however, the two diseases are absolutely distinct in character. Much mucus may be found on the walls of the colon in inactive chronic cases of infectious colitis, as in mucous colitis, but the general character of the underlying membrane is different. Also, the clinical history is different in the two diseases; the mucous colitis cases, save when very advanced, having constipation as their main factor rather than diarrhea. spells of diarrhea occurring only at intervals for short periods, if at all.

In the differential diagnosis of chronic or recurrent infectious colitis, three specific diseases of the intestine have to be specially considered. There are numerous forms of chronic diarrhea which are not cases of colitis. Many of these, as the diarrheas due to faulty assimilation of certain foods, as fats, carbohydrates, cellulose, those of nerve origin, those due to general debility often seen in pernicious anemia, pulmonary tuberculosis, heart disease, etc., serous diarrhea, are often incorrectly diagnosed as colitis from the clinical symptoms.

Infectious colitis can be distinguished from all these forms of intestinal trouble by the proctoscopic examination. The definite lesion of the mucous membrane always present in true inflammatory colitis is absent in all these condi-

tions. The same is true in regard to the disease known as mucous colitis, an entirely different disease from infectious colitis. The appearance of the mucous membrane is entirely different in this disease from that found in infectious colitis.

The three intestinal diseases which are most apt to be confused with chronic infectious colitis are: cancer of the colon or rectum, chronic dysentery, and tuberculosis of the intestine or tubercular colitis.

Cancer of the lower intestine may have often as its only symptom, for considerable periods, a chronic or recurrent diarrhea, with blood in the stools, that is, a stool picture similar to that of colitis. Proctoscopic examination will, however, at once differentiate colitis from the condition.

The general diffuse affection of the mucous membrane is absent in cancer. There may be redness and engorgement of the membrane locally in the region about the cancer, if the lesion, as is often the case, can be reached by the proctoscope. But there is no diffuse general affection of the membrane.

Chronic dysentery is, of course, a colitis. There is a mixed infection inflammation grafted upon the old ulcers and lesions of the amebae. In many cases of this trouble, the appearance of the mucous membrane is similar to that of a chronic infectious colitis. The finding of the amebae in the stools will, however, differentiate this disease from idiopathic colitis. It is possible that some cases of the Shiga dysentery may run a chronic course. Here again the finding of the organisms in the feces makes the diagnosis.

Tubercular colitis and ordinary infectious or idiopathic colitis may have absolutely similar clinical pictures. Chronic diarrhea, fever, blood, pus, and mucus, in the stools, a diseased membrane as seen by proctoscope, sometimes the acute active engorgement of the membrane, sometimes the more chronic granular appearance of the membrane—all these findings are present in both diseases. Differentiations can be made only by the finding of the tubercle bacilli in the feces. Where the bacilli are present and no active tuberculosis of the lungs is present, the diagnosis is tubercular colitis.

Unfortunately, the finding of tubercle bacilli in the feces by ordinary methods of examination is often a matter of great difficulty, even in cases where tuberculosis is present. The test for tuberculosis by the injection of the intestinal discharge into a guinea pig is not often of practical use, since the colon bacilli kill the pig.

I have had several cases of what appeared to be chronic infectious colitis, which were really of tubercular origin, in which it was possible to determine the existence of tuberculosis only after ileostomy, when the absence of feces in the colon made it possible to get a specimen of the discharge from the colon which did not kill the pig—all tests made before operation having been negative. The possibility that we are deal-

ing with a tubercular colitis must therefore be borne in mind in all these cases of apparent chronic infectious colitis.

Incidentally, I may mention that the treatment of surgical operation good for one is good for the other. Tubercular cases improve wonderfully with ileostomy, though colectomy would suggest itself as the most advisable treatment in these cases where it is feasible.

One other intestinal disease should be mentioned in connection with the diagnosis of chronic colitis. This is diverticulitis. Diverticulitis of the colon may have a somewhat similar clinical picture to colitis, with diarrhea and blood and mucus in the stools. Ordinarily, differentiation of the two conditions is simple, as diverticulitis does not show the characteristic membrane appearances of colitis, and the x-ray of the colon shows the presence of the diverticuli. In some cases, however, I have seen the two diseases associated, the x-ray showing diverticulitis and the membrane showing all the appearances of colitis. In such cases, it is probable that the diverticulitis is an etiological factor in setting up a chronic colitis. Confusion between the two diseases is, however, unusual, as in most cases the symptoms as well as the clinical findings are different in the two diseases.

The treatment of chronic and recurrent cases of infectious colitis depends upon the character of the case. Some cases of milder type, where the appearance of the membrane is of the granular character of low-grade inflammation already described, may be fairly well controlled by medical treatment, consisting of a diet which excludes substances giving a large or coarse intestinal residue, as fruits and cellulose vegetables, and the use of agar-agar powder and bismuth or calcium carbonate. In some cases, regular colonic lavage appears to give benefit. For the more severe cases, those showing a condition of active inflammation of the membrane or ulcerations, or any cases which fail to yield to medical régime, surgical treatment is indicated.

In many of these cases, the treatment is emphatically surgical, and delay in utilizing this form of treatment may have serious results as regards the life and health of the patient.

The operation selected in these cases of chronic colitis may depend somewhat upon the character of the case. In all serious cases it should be ileostomy with complete removal of all fecal contents from the colon. In the less severe cases, I have seen appendicostomy give excellent results.

Colectomy is advocated by some authorities. It is, however, a much more serious operation than ileostomy or appendicostomy. It is a difficult operation to perform satisfactorily in colitis, as the rectum is always involved in this disease. In my opinion, it should not be done until the other operations have been given a trial. Cecostomy should be utilized only in cases which

are suitable for appendicostomy but have no appendix. It does not take the place of ileostomy.

The résumé of my experience of operative treatment of ulcerative colitis is as follows:

Appendicostomy has given good results in cases of a moderate severity, which failed to yield to medical treatment. Following the operation, marked improvement has occurred almost immediately, and it has been possible to allow the opening to close and stop irrigation after a year without recurrence of the colitis. I do not think that closure should be allowed in any shorter time; as several of my cases which closed spontaneously in a shorter period have had to be opened again.

In many cases, appendicostomy has had but a slight beneficial effect, and it has been necessary to resort to ileostomy. I have come, as a result of my experience, to advise appendicostomy only in the definitely mild cases which fail of relief from medical treatment. But I do advise it in selected cases. It is a much simpler operation than ileostomy, involving no artificial outlet of intestinal contents and very little inconvenience to the patient. I have cases of appendicostomy doing their regular work without any inconvenience until the time when the opening can be allowed to close.

In all clearly severe cases I advise ileostomy at the start. With ileostomy I have seen cases which showed but slight or very temporary benefit from appendicostomy improve greatly.

The operation has undoubtedly saved the lives of many of my patients and has enabled them to live in comparative health and comfort while the ileostomy was functioning. The patient regains his weight and strength, and the appearances of active inflammation of the colonic membrane, as far as can be seen by proctoscopic examination, often disappear.

Whether a complete and permanent cure of the diseased colon, a healing so complete that the colon resumes and continues its normal function after closure of the ileostomy opening, without recurrence of the disease, occurs as a result of this operation, in the cases of colitis of such severity that the operation is necessary, is today an open question. The result of my experience is that, as a rule, such a complete and permanent cure has not been accomplished.

I have, as already stated, seen such permanent cure accomplished by appendicostomy, in the less severe type of case where we have used this operation, or by the employment of ileostomy with subsequent closure, in this type of case. But in the severe type of case I have never seen this result accomplished. In many of these severe cases, under the operation, the patients have regained health and strength and been able to live in comfort as long as the ileostomy was allowed to function. But in none of my cases of this type have we been able to close the

iliostomy, even after an interval of two years, without recurrence of the colitis.

This fact does not abrogate the value of the operation as a therapeutic measure in these severe cases. The operation is necessary to save the life or restore the health of the patients in these cases. And it accomplishes this result. It is possible that in some of these cases which have had an iliostomy, an operation joining the ileum to the lower sigmoid and leaving the opening at the colon end of the ileum for the purpose of irrigating the partially detached colon, can be done. By such means the discomfort of passing the feces by the iliostomy opening can be avoided. Dr. Jackson of Fall River tells me that he has done this operation secondarily to an iliostomy with success. The difficulty in the utilization of this operation lies in the fact that as the sigmoid and rectum are always affected in these cases, the ileum has to be attached to the diseased colon.

Of the third form of operation which can be utilized for a chronic colitis I have said little, as my experience with this operation is very limited. Appendicostomy and iliostomy are comparatively simple operations, not as a rule in themselves endangering life. Also, they can be undone at any time. Hence, we may be fairly free in advising them. Colectomy is a severe operation. Many of the cases of severe colitis would not stand it. Also since the rectum is involved by the infection, it is problematical whether operation can be successfully performed in colitis except by the expedient of leaving an artificial opening, which does not leave the patient in any more comfortable condition as regards permanent cure than does the simpler operation of iliostomy.

In closing, I wish to again emphasize the fact that colitis is often a surgical disease. Many patients have died or continued in a condition of wretched health because this fact has not been generally recognized by physicians. Do not delay too long in utilizing this treatment in obstinate or severe cases. The operation is simple and not, as a rule, dangerous to life, and can always be undone.

Another matter which I wish to emphasize is the value of proctoscopy in the study of intestinal disease and disturbance. This method of investigation will at once differentiate the organic disease of the intestine as colitis from the numerous forms of functional diarrhea. It may often result in the diagnosis of cancer of the sigmoid or rectum.

NATUROPATHS ARE PHYSICIANS.

THAT naturopaths are physicians has been upheld in the appellate court of California. In view of this decision the state prohibition director has requested National Prohibition Commissioner Haynes that naturopaths be accorded the privilege of obtaining whiskey prescription books.—*The Nation's Health*.

THE SURGICAL TREATMENT OF ULCERATIVE COLITIS.*

BY DANIEL FISKE JONES, M.D., BOSTON.

DR. HEWES has covered the subject of "infectious" or "ulcerative colitis" so thoroughly, and has given so much attention to the medical aspects of the condition, there is little to say except about the surgical treatment. I would like to emphasize what Dr. Hewes has already stated, that is, this ulcerative colitis is not a localized ulceration of the colon, nor are there several localized areas. The condition, whatever the stage it may be in, involves the whole colon from the anus to the ileo-cecal valve, occasionally stopping at the sigmoid, the splenic, or hepatic flexure.

Dr. Hewes told you that medical treatment should be tried in the milder cases, and even in these cases surgery should be resorted to if there is no improvement or if there is frequent recurrence under medical treatment. In all except the milder cases the treatment seems to be surgical. There are two types of operation:

(1) Those designed to permit washing of the colon, that is, appendicostomy and cecostomy.

(2) Those designed to cut off the intestinal contents from entering the colon at all, and also to permit washing of the colon, that is, a colostomy or an ileostomy.

If washing of the colon is the object, then appendicostomy should be done if possible. This operation is simple, the danger slight, and the inconvenience to the patient is practically nothing. If the appendix has been removed or if it is obliterated, cecostomy by the Witzel or Senn methods should be done. The operation is simple and the danger is slight, but the discomfort is often considerable as a tube must be worn constantly. If a tube is not worn there is more or less discharge of fecal matter and gas.

If the second type of operation is determined upon, two operations are available, a colostomy, if the disease has not gone beyond the splenic flexure, which is rare, and an ileostomy. It is impossible to perform a cecostomy which is effective in preventing all the intestinal contents from entering the colon. Before any operation is done it is important to explore the whole colon, to determine the extent and severity of the disease, provided the patient is not too ill.

The pathological findings at operation are quite characteristic. In the mild cases this is a slight thickening and an increased opacity of the bowel wall. The capillaries over the surface become visible and in places they are quite congested. The first row of glands beneath the colon are enlarged, but are rarely more than one-fourth inch in diameter. The disease occasionally stops at the sigmoid, the splenic or hepatic flexures, but in the great majority of cases it

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involves the whole colon to the ileocecal valve. I have never seen the ileum involved. In the more severe cases the intestinal wall is much thickened and quite white in color. The fine capillaries are everywhere dilated. The calibre of the bowel is narrowed and the walls stiffened, not unlike an intestine in spasm. In the more advanced cases the bowel is much contracted in places, making the colon very irregular. The first row of glands and all the glands of the mesentery remain about the same size as in the milder cases. These glands have been removed in all cases and tubercle bacilli have been found in but one case. Sections of the colon have been removed in several cases but no tubercle bacilli, and no constant bacterium found.

The simpler procedure of appendicostomy has been successful in a large percentage of the mild cases, so that the appendicostomy has been closed. In the more advanced cases in which an ileostomy has been done, the disease has not been cured in a single instance, but the patient is cured so far as his general condition is concerned. That is, in a large percentage of cases the patient improves wonderfully, gaining much in weight and strength, and is able to go to work, but the disease continues in the colon. One case improved so much it was determined to unite the ileum again after three years. The patient did well for six months and then began to pass blood in small quantities. Because it is impossible to say that ileostomy cures colitis, the operation should not be condemned, for the patient is comfortable, remains in good health and is able to work and be a useful member of society. It is often difficult to persuade patients to have an ileostomy, but I believe it is more difficult to persuade the family and the family physician, than it is the patient. The family and the physician say that it is useless to have such a disagreeable condition as an ileostomy, if it will not cure the patient, forgetting that the patient will be quite well, but with an unpleasant condition. They forget that without the ileostomy the patient will remain very uncomfortable, with frequent movements for a very long period unless they die early, as many of them do. The family and the family physician should not forget that most human beings would rather live comfortably, with an unpleasant condition such as an ileostomy, than to live feeling ill and weak, and having from five to twenty-five movements a day, without an ileostomy.

It should also be remembered that the ileostomy is not the cause of the condition in the colon, and that if the disease in the colon improves, the ileostomy can be closed very easily.

It has been the desire of Dr. Hewes and myself to do ileostomies upon these cases early in the course of the disease, with the hope that we might possibly cure the colitis. It has, however, been impossible to persuade any patient to permit it in spite of the fact that it can be predicted with considerable certainty that these

patients will go from bad to worse after they reach a certain stage. The ileostomy is all that anybody connected with the case can see; it seems to be impossible for them to see that death, or a miserable existence, is staring many of them in the face.

Many of the first cases operated upon were very far advanced and ileostomy was undertaken as a last resort, with the result that there was a considerable mortality. After reaching a certain stage these patients cannot stand an ileostomy because of the rapid loss of water and nourishment which follows the ileostomy. They must have enough reserve to exist until the small intestine can readjust itself to absorbing enough fluid and nourishment to keep the patient alive.

THE PRACTICAL MANAGEMENT OF DYSMENORRHOEA.*

BY SAMUEL R. MEAKER, M.D., M.R.C.S., BOSTON.

By actual incidence of cases dysmenorrhoea is one of the commonest human ailments. With comparative infrequency, however, do women seek medical advice primarily for this trouble. The records of a large gynaecological clinic show that less than two per cent. of its patients came with dysmenorrhoea as their chief complaint. The reasons for such indifference on the part of the laity are not far to seek. The very frequency of the condition causes it to be regarded more or less as a matter of course. It is felt, too, that in process of time there is likely to be improvement, particularly after marriage and the bearing of children. A survival of the false modesty which flourished in the early Victorian age operates to keep many patients away from the physician. And, finally, a lack of attention to this problem on our part has produced a not entirely unwarranted belief that little is to be expected from us in the way of really efficient treatment.

While dysmenorrhoea may be neglected, it is by no means rightly a negligible problem. It accounts in industry for a loss aggregating one per cent. of the total time of female employees.¹ It is a factor definitely to be reckoned with in schools and colleges. The sum total of preventable suffering which constantly goes on from this cause is enormous. It happens occasionally, though fortunately not often, that dysmenorrhoea is the presenting symptom of serious pelvic disease which should have prompt investigation and treatment.

In view of these facts, and of the further fact that in every field of practice there is today a tendency to develop along the lines of hygiene and preventive medicine, it seems that the time is opportune for an inquiry into the problem of

*Read before the Massachusetts Surgical and Gynaecological Society, May 26, 1923.

dysmenorrhoea, with the purpose of determining whether a really practical scheme of management cannot be devised. It must be recognized at the outset that no scheme can be considered practical for general use unless it conforms to the following standards:

1. Routine pelvic examination is not feasible, at least in the virginal cases which constitute the greater number of dysmenorrhoeas. Particularly is this true when the problem is taken up in industries and in schools. It must be made possible, on the basis of a history alone, to recognize the few cases which require local investigation, and to treat the others without examination.

2. For similar reasons, local treatment should be advised in virginal cases only when it is clearly indicated. This applies not only to surgery, but also to office treatment and to local measures, such as douches, which may be carried out by the patient herself. I am opposed to the establishment of the douche-habit in unmarried girls, except for a definite reason. In about twenty per cent. of cases permanent results can be obtained only by surgical or other local measures, and in these such treatment should be recommended. In another twenty per cent. the patients can usually be helped by surgery, but equally good results will follow proper general treatment, and this should be the first method of choice. In the remaining sixty per cent. local treatment has little or no real value, and should not be considered. Routine dilatation and curettage in dysmenorrhoea, without selection of cases, has brought small satisfaction to the patients, and small credit to the profession.

3. In the therapeutic scheme there should be a double aim: first, to give from the start immediate relief from menstrual suffering by proper palliative measures; and, second, to accomplish something in the way of a permanent result, so that ultimately all treatment can be discontinued. This is the really important objective. Our plan should not involve making these patients permanent patrons of the drug store.

4. The scheme of management, both diagnostic and therapeutic, must be sufficiently simple so that it does not require a trained gynaecologist to carry it out. It must be applicable by those who see dysmenorrhoea in quantity—that is, by the industrial physician, the school physician, and the family doctor.

A rather complete survey of the literature on this subject disclosed two striking facts: first, that the total amount of that literature is surprisingly small; and, second, that it would be hard to find on any other subject an equal amount of contradiction and difference of opinion as regards etiology, pathology, classification, treatment, and every other detail.

From the clinical point of view there are undoubtedly different types of dysmenorrhoea, and some sort of grouping must be attempted before the problem can be handled. A pathological

classification is inadequate in a condition which often presents no anatomical pathology. A grouping according to symptoms offers the most satisfactory working basis.

So considered, dysmenorrhoeas fall into two great groups. In the first, which I shall call Group A, the clinical picture is as follows: The pain begins some time, often twenty-four or forty-eight hours, before the flow. It is frequently relieved as the flow becomes well established, but may persist throughout the period. In character it is dull, dragging, and constant; it is felt all through the lower abdomen; it is very often accompanied by backache, and sometimes by pains in the thighs. Nausea, vomiting, and headache are frequent. The amount of the flow is sometimes normal, but often increased. Leucorrhoea and other intermenstrual pelvic symptoms are common.

This will be recognized as the picture of chronic passive congestion of the pelvis, upon which each menstrual period superimposes an acute phase. Even the headaches and gastric symptoms, commonly called reflex, may be due to congestion of the meninges and gastric mucosa as a result of an abnormal endocrine-sympathetic balance. This type of dysmenorrhoea is nearly always accompanied by definite pelvic pathology; the list of conditions commonly responsible includes pelvic inflammation in all its phases, chronic passive congestion from faulty sexual hygiene, fixed retroversion-flexion of the uterus, fibroid tumors, and occasionally severe chronic constipation. The onset of such dysmenorrhoea is usually subsequent to puberty, and coincides with the development of the underlying abnormality. Cases in Group A form about ten per cent. of virginal dysmenorrhoeas. Among married women they are relatively much commoner; in general, a case of this type may be expected to get worse rather than better after marriage.

The clinical picture of Group B is very different. The pain begins approximately with the flow—at any rate, not more than an hour or two before or after. It ordinarily lasts a few hours only. In character it is most commonly intermittent, spasmodic, and cramp-like, though occasionally it is described as a burning or boring pain; it is nearly always felt in the lower mid-abdomen over the uterus. Nausea and vomiting are fairly common, but headache is much less so; marked weakness and general nervous irritability are often encountered. The amount of flow is usually normal, but sometimes diminished. Intermenstrual pelvic symptoms are, as a rule, absent.

This type of trouble is best regarded, it seems to me, as a disordered reflex. The painless, easy, rhythmic uterine contractions of normal menstruation are replaced by irregular, spasmodic, and painful contractions producing usually a typical cramp or colic, and occasionally a steady tenesmus-like pain.

Now the cause of a disturbed reflex may be located in any of three places—on the afferent sensory limb of the reflex arc, in the central nervous system, or on the efferent motor limb of the arc. Among dysmenorrhoeas of Group B we find cases where the disturbance is in each of these localities, and on this basis Group B is divided into Subgroups BI, BII, and BIII.

In Subgroup BI the reflex is upset by excessive sensory stimuli coming from the endometrium, and evoking correspondingly excessive motor responses from the uterine muscle. Any endometrial condition which produces local irritability may be responsible—polyps, small submucous fibroids, or the so-called exfoliative endometritis which gives rise to membranous dysmenorrhoea. The symptomatology of this subgroup is that of Group B in general, plus a somewhat increased flow with clots or membrane, and often an intermenstrual leucorrhoea. Subgroup BI includes about ten per cent. of virginal cases.

In Subgroup BII the reflex is overactive because of conditions in the central nervous system. There is a general nervous hypertension, of which the patient may or may not be conscious, an increased nervous irritability, a low threshold of stimulation, and a diminished resistance at the synapses. About sixty per cent. of virginal cases belong to this group, in which all pelvic pathology is absent. The development of this state is favored by the complex conditions under which the modern girl lives. The strenuous life is the rule, whether it be scholastic, industrial, or social. Add to this irregular hours, unbalanced diet, and lack of exercise, faults present more or less throughout the adolescent period, and the wonder is that nervous instability in girls is not even commoner. Cases in this subgroup present the general symptomatology of Group B. There is no suggestion of pelvic pathology. Hygienic faults are readily discovered; the highly strung nervous state of the patient may or may not be obvious. A certain degree of anaemia is often present. Such symptoms as marked weakness, psychic disturbances, and items of a purely reflex nature are common.

The remaining twenty per cent. of virginal cases belong to Subgroup BIII, where the cause of the disturbed reflex-action lies in the musculature of the uterus. The most frequent condition present in these cases is a degree of pelvic hypoplasia or pelvic juvenilism. The uterus contains much less than its normal amount of muscle, and relatively much more connective tissue. The result is that the muscle is splinted, and its contractions are irregular, spasmodic, and ineffectual. The same state of affairs appears sometimes in women in the late thirties in connection with fibrosis of the uterus, and sometimes as an end-result of long-standing chronic pelvic inflammation. The juvenile uterus, which is described by an English gynaecologist

as weeping tears of blood in its sexual agony, may complete its development as a result of marriage, and always does so if pregnancy occurs. This subgroup is to be distinguished by certain symptoms in addition to the usual ones of Group B. Pain of the steady burning or boring type located directly over the uterus is fairly common, instead of intermittent cramps. The amount of the flow is likely to be diminished, and may be irregular and interrupted, with clots. Reflex symptoms are not particularly frequent. Occasionally there may be non-pelvic evidence of faulty endocrine balance, though this is by no means a necessary concomitant of the hypoplastic pelvis.

The foregoing interpretation of dysmenorrhoea is not offered as the last word to explain the causation and mechanism of this complaint. It was evolved in the beginning as a working hypothesis, and has since justified itself in two ways. In the first place, as these cases are studied clinically, they fall with remarkable accuracy into one or another of the groups and subgroups which we have defined. Mixed types and border-line cases occur, of course, but the great majority can be clearly identified, on the basis of history, with one of the types here described. In the second place, a scheme of treatment based upon this interpretation proves to have a very satisfactory degree of efficiency.

As already noted, our therapeutic system should produce two things—an immediate palliative relief, and an ultimate permanent benefit. How this is accomplished in the different types of dysmenorrhoea will now be briefly outlined.

The preliminary step in all cases of Group A is to remove, if they are present, two defects—faulty sexual hygiene in the married, and chronic constipation. Both conditions are fruitful sources of pelvic congestion, and their adjustment will sometimes produce a permanent and complete cure in dysmenorrhoea of this type. Even if other trouble is present, it is helpful at the outset to eliminate these factors, and so to clear the decks for further action. The treatment of chronic constipation in women must be undertaken systematically, for a casual handling of the problem will produce very uncertain results. A satisfactory régime for ordinary cases includes the following six items, which are given in the order of their importance: (1) the enlisting of the patient's interest and coöperation, (2) regularity of habit, (3) large fluid intake, (4) diet, (5) abdominal exercise and massage, (6) small doses of liquid petrolatum at the beginning of treatment.

If the above-mentioned errors are not present, the patient is told that the proper management of her case with the expectation of permanent benefit requires a pelvic examination, with probable surgical treatment. Only in this way can we discover the pathologic condition which is responsible for the pelvic congestion, and treat it by the recognized surgical or other local meas-

ures. Commonly encountered conditions are fibroid tumors, fixed retroversion-flexion, prolapsed and polycystic ovaries, and all types of pelvic inflammation.

In cases where pelvic examination is impractical, and where there is little likelihood of inflammatory disease, certain palliative measures for the relief of congestion may be used, with the full understanding that they are palliative only. The routine under such circumstances consists of exercises to be performed daily throughout the month, and a very hot five-minute sitz bath to be taken at night for two days before, and every day during the period. Depleting douches may be added if it is thought necessary.

The exercises are best carried out at bedtime after the patient is undressed, and consists of three parts.

1. The patient lies on her back with the knees drawn up, and slowly, but with the maximum of force, alternately draws in and pushes out the musculature of the lower abdominal wall to the fullest possible extent. This should be repeated twenty times, at a rate not faster than five times a minute.

2. Lying in the same position, the patient slowly and forcefully contracts the levator ani, and maintains the contraction for five seconds. It is easy to explain what is required here by stating that the effort is the same as one would make in trying to hold in a loose bowel movement. This is repeated five times a minute for twenty times.

3. Finally, the knee-chest position is assumed for five minutes. The labia should be separated in order that the vagina may be ballooned by atmospheric pressure.

These exercises are surprisingly vigorous, and in the course of weeks, if faithfully carried out, will produce a definite effect in the way of stimulating the pelvic circulation and relieving chronic congestion.

In Subgroup BI, as in Group B generally, a very useful palliative remedy is found in the benzyl esters, which relieve the cramp-like or colicky type of pain arising from the spasmodic contraction of smooth muscle. In my experience better results have come from the benzoate than from the succinate. For patients of this subgroup, the dose is two five-minim gelatin globules, to be taken at the first indication of pain, and repeated in half an hour unless marked relief has been experienced.

The radical cure of this type of dysmenorrhoea depends necessarily upon local treatment of the endometrium. The first step is an ether examination, with dilatation of the cervix and thorough exploration of the uterine cavity. It is easy to overlook small polypi or small submucous fibroids, and if there is any question of these being present, dilatation should be supplemented by anterior vaginal hysterotomy. The

conditions encountered are dealt with by curettage or other appropriate measures.

In Subgroup BII benzyl benzoate serves very well as a palliative measure for the relief of cramp-like pain. Unless the stomach is upset, I prefer to give it to these patients as the twenty per cent. alcoholic solution, a teaspoonful to be taken in hot water when pain begins, and repeated in half an hour if needed. Two other drugs are occasionally useful in the palliative treatment of this subgroup. When the patient is definitely of the nervous type, it is well to order ten grains of sodium bromide three times a day for a week before the period. When nausea and vomiting are conspicuous symptoms, good results are frequently obtained from *corpus luteum*, given in five-grain doses three times a day during the premenstrual week.

The keynote of treatment leading to a radical cure in Subgroup BII is attention to the general health and hygiene of the patient. This demonstrates itself automatically in the frequent cases who suffer severely during the school year, but are entirely relieved in the summer vacation. One must be very specific in outlining the treatment for these cases, as general recommendations about hygiene are seldom sufficient to break the faulty habits of years. The first step is to be satisfied that the patient is not suffering from anaemia or other constitutional disease. Then rest and out-of-door exercise are prescribed in definite quantities. The general mode of life, and the matters of sleep, diet, bowel regularity, posture, and bathing are systematically considered; if faults are present, a well-arranged program for their correction is outlined.

The element of suggestion is not to be overlooked. Many girls have been taught by the elder generation to regard themselves as semi-invalids during the menstrual period, and so in course of time an attitude develops which is mental more than physical. Patients of Subgroup BII, like non-dysmenorrhoeic girls, are best advised to lead their normal life as far as possible in every way during the period.

Thirty years ago Fliess, a German rhinologist, discovered that some dysmenorrhoeic patients were relieved temporarily by cocaineization and permanently by cauterization of the so-called genital spots in the nose—the anterior end of the inferior turbinate bone and the opposite tubercle on the septum. This fact has been confirmed by several other observers.

The conclusion of Fliess that dysmenorrhoea in these cases is due to nasal disease, and his term, nasal dysmenorrhoea, appear to me unreasonable. The psychic effect of the procedure and the stimulating action of the cocaine are undoubtedly responsible for the benefit received in many instances. When permanent cure results from cauterization, the mechanism may be some obscure readjustment of balance in the sympathetic nervous system.

The only patients that could conceivably be

helped in this way are those belonging to Subgroup BII. I have used it in two such cases, with excellent results. It seems to me that the method is worth a further trial, with proper selection of cases and due appreciation of its limitations. It is easy and safe, and may have a very satisfactory effect when other treatment has accomplished little.

In Subgroup BIII the palliative action of benzyl benzoate may be tried. It works well when the pain is definitely of the intermittent cramp-like sort, but less so when there is steady burning or boring pain. In these cases one may use some non-specific analgesic drug such as aspirin or one of the coal-tar derivatives.

To obtain permanent benefit in this type of case, presenting hypoplasia of the uterus, is a slow and sometimes a difficult matter. The usual treatment includes two items—the pelvic exercises already described, and endocrine therapy. This last cannot be regarded as established on a scientific basis, but must be carried out empirically. The following routine has brought results in a number of cases:

1. Whole ovarian substance, five grains three times a day from the end of one period until three days before the next.

4. If there is any suggestion of hypothyroidism, the basal metabolic rate is determined, and if the condition suspected is found to be present, the pituitary extract is omitted and appropriate doses of thyroid are used instead.

5. In all cases thirty grains of calcium lactate are given every second night throughout the month, for the stimulating effect of calcium on smooth muscle.

I am aware that this régime may be criticized by the scientific endocrinologist. It is somewhat elaborate, but aims to supply as nearly as possible those elements in which the patient herself appears to be deficient. In any case this and the pelvic exercises must be continued for some months before results can be expected. Under such treatment some patients of Subgroup BIII show a definite and permanent improvement. If this has not appeared at the end of six months, I am accustomed to advise a dilatation of the cervix. One undertakes this measure with no idea of relieving obstruction from cervical stenosis; its virtue lies in a vigorous mechanical stimulation of the uterus—ten weeks of massage compressed into ten minutes.

For the study of the problem of dysmenorrhoea along the lines here laid down there are

SUMMARY OF TREATMENT IN TABULAR FORM.

	Palliative	Radical
Group A	(first)	(first)
	Correction of chronic constipation Correction of faulty sexual hygiene	
	(later if necessary) Pelvic exercises (except in inflammatory disease) Hot sitz baths Depleting douches (in selected cases)	(later if necessary) Examination and surgery or other local treatment
Group B		
Sub-group BI	Benzyl benzoate, 5 minim gelatin globules	Dilatation of cervix, and local treatment of endometrium
Sub-group BII	Benzyl benzoate, 20 per cent. alcoholic solution Bromide (in nervous types) Corpus luteum (for vomiting)	Systematic correction of hygienic faults Suggestion Nasal cauterization (in selected cases)
Sub-group BIII	Benzyl benzoate, 5 minim gelatin globules Aspirin (in pain of steady burning type)	(first) pelvic exercises endocrine therapy (later if necessary) dilatation of cervix

2. Beginning three days before the period, and continuing through it, the patient omits the ovarian substance and uses corpus luteum in the same dosage.

3. Ten drops of extract of whole pituitary is given once daily throughout the month, unless there is thyroid insufficiency.

at present several clinics organized or starting in different schools and industrial plants. Their number is to be increased, and it is hoped that a thousand cases will have been handled by the end of the present year. The records are kept on a uniform blank, so that data can easily be tabulated and classified. The results of this

work will be made the subject of a later detailed report; it is premature to say anything now except that so far they have in general been very satisfactory, and have supported the conclusions drawn from the smaller number of cases seen in dispensary and private practice.

This investigation is in line with what may be called the newer medical gynaecology. Fifty years ago all gynaecologic practice was medical, if we except an occasional daring and brilliant ovariectomy. The general health of patients received excellent attention, but as regards definite pelvic therapeutics, there was little to choose between the internal administration of useless drugs and almost equally useless local applica-

method of choice. The first factors contributing to this point of view were the development of radiotherapy and the modern advances in endocrinology. The list of non-surgical items properly belonging to our field has steadily grown, and today includes such additional matters as the hygiene of the adolescent girl, sex-hygiene in the adult, the correction of postural and static defects producing abdominal symptoms, the social management of venereal disease, the treatment of the pelvic neurasthenic, the relation of pelvic signs and symptoms to non-pelvic disease, and the proper use in their place of palliative therapeutics. Only by attention to such details as these can we arrive

SPECIMEN OF RECORD CARD USED IN DYSMENORRHOEA CLINICS

ORGANIZATION	NAME		DATE
GENERAL DATA	Age	Past history	
	Constipation	Hygiene	
	Haemoglobin	Type	
	Weight		
MENSTRUAL DATA	Began at	Regularity	Date of last
	Duration		Amount
DYSMENORRHOEA	Pain begins		Lasts
	Character of pain		Incapacity
	Reflex disturbances		
	Intermenstrual symptoms		Clots
	Age of onset		
	Previous treatment		
PROVISIONAL GROUPING	REMARKS		
TREATMENT	TO REPORT		
FOLLOW-UP			

tions to the genital tract. The pioneer plastic work of Sims, and the development of abdominal surgery which followed upon the discoveries of Lister marked the dawn of the purely surgical era in gynaecology. During this period the anatomical idea was predominant, and the broader aspects of a patient's problem often received scant consideration. A woman was only a woman, but a retroverted uterus was an operation. Many a cure was anatomically perfect, while at the same time, for some strange reason, the symptoms of that patient persisted unrelieved. Even today a similar habit of practice is encountered in some quarters.

The modern gynaecology recognizes fully the great value of surgical therapeutics in a large number, perhaps the majority, of pelvic conditions, and is glad to avail itself of the splendid advances in technique which have been made during the past thirty years. At the same time it realizes that there are many aspects of pelvic disease for which surgery is not the therapeutic

at the broadest understanding of our problems, and keep our department of practice abreast of others in the general advance of modern medicine along lines of personal hygiene, the prevention of disease, public health, and social science.

REFERENCE.

- 1 Meaker, S. R.: A Preliminary Note on Dysmenorrhoea as an Industrial Problem. Jour. Indus. Hyg., June, 1922, Vol. iv, No. 2, pp. 49-52.

PROVISIONAL MORTALITY FIGURES FOR 1922.

FIGURES compiled by the Bureau of the Census for 1922 show slightly higher mortality rates than for 1921. For the 33 states shown for both years, the 1922 mortality rate was 11.9, against a rate of 11.6 for 1921, the highest 1922 rate being 14.7, for Maine and the lowest 8.1, for Idaho.—Department of Commerce, Washington.

CANCER OF THE CERVIX UTERI.*

BY WILLIAM P. GRAVES, M.D., BOSTON.

I SHALL discuss the subject of cervical cancer by reviewing the various types of cases that present themselves for treatment, with special reference to the manner in which we are personally treating these cases at the present moment. The most important type is what is usually termed

The Operable Case. The discussion of this heading requires, first, a definition of operability and, secondly, an argument as to the comparative merits of operation and radiation. Before radium came into vogue operability depended on the surgeon's individual estimate of his ability to perform a radical operation without running too great a risk of killing the patient on the table. As a consequence, the variation in operability percentages was enormous, ranging as it did from 10 per cent. to more than 80 per cent. A few rash operators, satisfied with a 25 per cent. mortality, and determined to eradicate the disease at whatever expense of damage to the patient's excretory organs, brought upon the operation an undeserved opprobrium; while the timid surgeon, with his 10 per cent. operability, created a feeling of hopelessness regarding the disease as a surgical proposition. Since radium has come into use the matter of operability has undergone a very marked change, and I may best illustrate this by recounting our personal experience at the Free Hospital. In a report made by me in 1920 of cases operated on by Dr. Pemberton and myself, the operability figure was approximately 64 per cent. Since that time, as a result of an increasing reliance on the aid of radium, the percentage has appreciably dropped. In deciding on the operative treatment of a given case, the question is no longer, "Can we perform a radical operation without killing the patient," but rather, "Have we, by performing a radical operation, a reasonable chance of curing the patient?" We feel that with our considerable experience in operating on all kinds of cases, and following the results, we can answer this question with a fair degree of accuracy.

Thus it will be noted that we have practically eliminated the so-called border-line case. The border-line case is not standardized, as I have already suggested, but implies a doubt in the surgeon's mind as to whether he is physically capable of removing the uterus of the case in question. Speaking from a personal standpoint, I am free to admit that when such a doubt arises in my own mind I usually assign the case for treatment with radium. Whether this decision is an indication of sound common sense, or whether, under a false sense of security it is in reality an avoidance of the responsibility of performing a very hard operation, I am unable

at present to say. Ultimate results will tell. Personally, I confess to a sense of relief in escaping from certain difficult operations which we formerly felt duty-bound to undertake.

Changing, then, the term *operability* to the expression *curability* by operation, we will take up the question of treating such cases by radium or operation. From what has been said already, it is unnecessary to state that we believe emphatically in operating on curable cases. And we are also ready to state that our experience with radium leads us to believe that, in the absence of metastasis, a case of cervical cancer that is curable by operation is also curable by radium. Why, then, operate when it is so much simpler to use radium? The answer must be a personal one when we say that, with our individual equipment of operative experience, on the one hand, and of certain radium facilities on the other, in attacking a given case of curable cancer of the cervix we feel much surer of hitting the mark with an operation than with radium. To say that a case is curable by operation is not equivalent to saying that an operation will cure the patient, for the operator may have misjudged the extent of the disease or he may perform an incompetent operation; and the same may be said of radium in a curable case. However, there is no doubt in our mind that under present conditions operation distinctly offers the greater chances of success than does radiation, for the following reasons:

1. Although cancer of the cervix, as a rule, metastasizes in the regional lymph glands comparatively late in the disease, nevertheless it not infrequently happens that in cases when the local affection is early and the growth frankly operable, the glands are found involved. This seems to be especially true in young women. Such cases may sometimes be permanently cured by operation. If radium be used, the disease localized in the cervix may be cured, but the more distant regional lymph glands cannot reliably be treated even by the most powerful internal and external radiation.

2. In curable cases, with the disease definitely localized in the cervix, there is no doubt whatever that surgical removal of the entire organ is a more certain means of eradicating the growth than is radiation. Everyone who has used radium has been chagrined, on occasions, to find that he has missed the mark and that only a part of the growth has been successfully stormed by his radium forces. New methods of treatment, especially those by which emanations in seeds are employed, have greatly reduced the chances of this source of failure; nevertheless, I cannot conceive how, even with the most expert application, radiation can be compared in certainty with surgical removal, at least until the time comes when means are discovered by which rays of greater penetration may be produced.

*Read before the Boston Surgical Society, February 19, 1923.

3. In treating a curable case of cervical cancer it must be remembered that patients differ in their individual reaction to radium—a fact that is especially apparent in the treatment of non-malignant myopathies. The proper relationship of the dosage to the individual is an unknown but probably important factor. Moreover, it should be kept in mind that so-called cancer of the cervix represents in its category several different types of carcinoma which possess individual characteristics of growth, and which doubtless react differently to radium. This is another important field of inquiry which has only slightly been explored.

In view of these disturbing factors, one need not be surprised at the occasional sinister case in which, after a standard application of radium, the disease is stimulated to an appallingly rapid growth.

4. A word should be said in defense of the radical operation, the evils of which have been greatly exaggerated by certain radium enthusiasts. To disprove the accusation that the operation is attended with a prodigious mortality, and that it is followed by ghastly fistulas and other mutilations, one need go no further than the work of the operators in this community. The published figures of Dr. Davis, Dr. Cobb, Dr. Pemberton and myself show a uniformly low mortality and only rare occurrence of fistulae, while the figures of Dr. Cobb regarding curability surpass all records with which I am familiar.

It should be remembered that all these reports include many border-line and desperate cases. If, as we have proposed, such cases be eliminated from the operability standard, the ultimate results of the radical operation for cervical cancer should not differ appreciably from those of hysterectomy for other causes.

Preoperative and Postoperative Radiation.—Many operators make a preliminary application of radium, some with the purpose of making an inoperable case operable, others using it simply as a routine prophylaxis in a frankly operable case. We have had some experience in operating on cases made operable by radium and found it very unsatisfactory. The increased difficulty of the operation, septic complications of convalescence, and invariable recurrence of the disease have led us to abandon the practice.

The practice of applying radium as a routine preoperative measure in frankly operable cases is popular, but it is difficult to understand its value. Radiation in such cases cannot reach further than the knife, while it has the disadvantage of devitalizing the normal tissues and making them more susceptible to sepsis when the operation is performed. As a preliminary cleansing measure it has no special advantage over a judicious curettement and cauterization.

Postoperative radium prophylaxis is at the present time recommended by the majority of operators. We do not make a routine practice

of this measure in every case. If the operation has been a satisfactory one, that is to say, if we feel that we have removed all of the disease, we do not use radium. In such cases the tissues at the vault of the vagina are thin and there is peculiar danger of producing fistulae from a radium burn. If, however, we are doubtful of having removed the disease,—and such a doubt usually implies a certainty,—radium is applied as soon as the vaginal wound is healed. In some of these cases radium has undoubtedly prolonged the patient's life and increased her comfort. This comparative success has influenced our judgment during the progress of an operation in cases in which the disease is found to be more extensive than was expected. Thus if the parametrium proves very difficult we are accustomed to abandon the complete Wertheim technique, and to take a short cut on one or both sides close to the cervix, relying on the later radium treatment to take care of possibly diseased parametrial tissue which could not be removed without considerable danger to the patient.

Operable Cases with Contraindications.—During the last two years we have encountered an unusual number of cases which, though technically operable, presented certain contraindications to operation, chiefly cardiac or renal disease, old age, and obesity. Of these, obesity is, in our opinion, by far the most important on account of its increasing enormously the technical difficulties of the operation. These comparatively early cases have been treated by radium alone, and their outcome will be of great value in determining the relative merits of radiation and operation.

Border-line Cases.—It is necessary to add a few words to what has already been said concerning border-line cases. These cases are usually incurable by operation or by radium, although by either method a lucky shot may occasionally bring off a successful result. We have, as we have said above, relegated them to the radium treatment because radiation is less dangerous to the patient's life, and, on the whole, produces equal if not better results in the prolongation and comfort of life. An exploratory incision is always justifiable to determine the exact extent of the disease.

I have been very much impressed recently by a number of cases that have reported after a radium treatment given from a year and a half to two years previously. The patients have during that time been in excellent health without local signs, until a short time before their return, when they have begun to show symptoms of the disease in the regional lymph glands. Vaginal examination often shows no local evidence whatever of cancer. In some, masses can be felt on the sides by abdominal palpation; in others the presence of the disease is evidenced only by the characteristic pain. It seems rea-

sonable to believe that some of these patients might have been cured, or at least had their lives prolonged if at their first appearance the affected glands had been removed before the radium treatment had been applied. With this idea in mind we have recently instituted the policy of exploring the abdomens of inoperable but not hopeless cases, and of removing if possible the affected glands.

Hopeless Cases.—We treat with radium practically every inoperable case of cervix, no matter how hopeless, unless fistulae have been established; and in most instances we have been able to relieve the patient of bleeding and discharge and frequently of pain. Evil results from radium in these cases, such as have often been described, we also have encountered, but they have usually followed a too enthusiastic application of the radium. In the hopeless as well as in the curable cases it is our experience that whatever benefit the patient is to receive from the radium treatment must be secured at the first dose. Secondary treatments rarely if ever help the patient and frequently stimulate the growth of the disease in an astonishing manner.

Recurrence.—Local recurrence in the vagina after radical operation is peculiarly amenable to radiation. We have in our series evidence to show that the disease may sometimes be thereby ultimately cured. Extension and reappearance of the disease in the glands is in our experience hopeless. Powerful x-ray is the only resource.

In conclusion it should be said that in our treatment of cancer of the cervix we have lacked the advantage of being able to employ emanation seeds, and the x-ray. There is little doubt that in an extended series of cases the final results would be materially improved by these two important adjuncts.

Book Reviews.

A Text-Book on Minor Surgery. By JOHN C. VAUGHAN, M.D., Director and Visiting Surgeon, Beckman St. Hospital, N. Y., and ATHEL C. BURNHAM, M.D., Colonel in U. S. Army. Illustrated with 459 engravings. Philadelphia and New York: Lea & Febiger. 1922. Pp. 627.

The authors of this book emphasize the important part played by minor surgery in the surgical practice of today. An attempt is made to point out the simplest and most efficient surgical procedures, the writers believing that, while more complicated technique may be more efficient in the hands of the originators, it leads to complete failure in the hands of the unskilled.

The book is well illustrated with many very good engravings, but the legends are not always

clear. The opening chapters deal with general considerations of injuries to the soft parts, inflammation, fractures, and injuries to joints. These points are then taken up as applying to the head, the upper and lower extremities and the trunk. The sections on tumors and rectal and anal conditions are well written and well illustrated. Minor surgical conditions of the external genitals of both sexes are treated in a careful manner.

Some of the essential points on local anesthesia are instructive. Finally there are sections on bandaging and surgical technique, without which no text-book on minor surgery would be complete.

The entire book shows careful preparation. It fills a distinct need of student, nurse, general practitioner as well as surgeon.

A Reference Handbook of the Medical Sciences. embracing the entire range of Scientific and Practical Medicine and Allied Sciences. By various writers. Fourth Edition. Edited by THOMAS LATHROP STEDMAN, A.M., M.D. Complete in Eight Volumes. New York: William Wood & Company. 1923. Price \$80.

The Fourth Edition of *A Reference Handbook of the Medical Sciences* consists of eight Imperial Octavo volumes with a total of 7320 double column pages, over 5000 illustrations, and 3914 signed articles on almost every conceivable subject connected with the science of medicine. All of the 445 contributors are American or Canadian, many of them men of international reputation. We regret the presence among them of several writers, the soundness of whose work has been questioned by the JOURNAL.

Among the new articles on subjects brought out prominently by the war experience we find War Gas Poisoning, by Dr. Frank P. Underhill, of Yale University; Trench Fever, by Dr. M. I. Samuel of Wilmington, Delaware; War Neurosis (Shell Shock) by Dr. James K. Davis, of New York; Medical Aspects of Aviation, by Lieut. Neuberger, of the United States Navy. Articles on the Army, Navy, and Public Health Service have been thoroughly revised, to meet the changing conditions in these services. Among these articles are the Army Medical Department, by Col. J. R. Kean; Army Medical Service in Campaign, by Major A. D. Tuttle; Naval Medical Service, by Lieut. Comdr. L. W. Johnson; Hospital Ships, by Comdr. Richmond C. Holcomb, United States Navy. The article on Gun Shot Wounds, written for the third edition by the late Col. La Garde, has been entirely rewritten in the light of recent experience by Dr. R. B. Pratt of Bellefontaine, Ohio, who served in the Medical Service during the war in France. Among other new articles are one on Asthma, by Dr. Spingarn, of Brooklyn; the Schick Reaction, by Dr. W. H. Park, of the New

York City Board of Health; Encephalitis Lethargica, by Dr. John E. Lind, of Saint Elizabeth's Hospital, Washington; Tularemia (Deerfly malady) by Surgeon Edward Francis, of the Public Health Service, who was the discoverer of this disease; Organotherapy, by Dr. Blumgarten, of the Mt. Sinai Medical Service, New York; Violet Ray Therapy, by Dr. A. J. Pacini, formerly of the U. S. Public Health Service; Alastrim, by Dr. W. C. Rucker, Chief Quarantine Officer, U. S. Canal Zone; State Medical Licensure, by Dr. William B. Cutter; Basal Metabolism, by Dr. W. P. Anderton of New York City; and Antiseptic Treatment of Wounds, by Dr. J. G. Sherrill of Louisville. Among minor additions we may mention apothecine, barbital, benzyl benzoate, butyn, erataegus, libradol, protein therapy, colloidal gold reaction, Sachs-Georgi reaction, sigma reaction, soldiers' big belly, irritable heart of soldiers, trench foot, trench shin, fluidglycerita, etc. There are also biographical sketches of Dr. Buck, editor of the first and second editions of the Reference Handbook; Drs. Abraham Jacobi, Theodore Janeway, George M. Gould, Sir William Osler, and Stephen Smith. The materia medica articles have been revised to conform with the latest editions of the U. S. Pharmacopoeia and the National Formulary, and the statistics of population in the 1920 census have been incorporated in the climatological articles.

Among the articles which have undergone more or less extensive revision we note Diphtheria, Immunity, Yellow Fever, Food and Drug Control Laws, Beriberi, Paralysis Agitans, Pellagra, Scurvy, Radiotherapy, Radio Activity, Rickets, Narcotic Drug Legislation, Workmen's Compensation Laws, Quarantine, Plague, Typhoid Fever, the U. S. Public Health Service, Edema, Yaws, Trypanosomiasis, International Congresses, the American Medical Association, Gout, Coroner, and Death Certificates.

Naturally the reviewer has been unable to read the 7320 pages which compose this comprehensive work. Such articles as he has read have been clearly written and have contained all the essential facts bearing upon the subject treated. We would consider the Reference Handbook a valuable aid in the practice of medicine.

A Synopsis of Surgery. By ERNEST W. HEY GROVES. New York: Wm. Wood & Co. 1922. Pp. 621. \$4.50.

In this new sixth edition the author has introduced many of the modern surgical ideas. He has effectively summarized the main facts in the etiology, course, complications and treatment of the commonest surgical conditions. Each subject is treated in outline form without an extended description of any of the methods or operations.

There are few illustrations, but there is a

wealth of material in this little book for anybody interested in any phase of surgery.

Rest and Other Things: Environment and Resistance in Tuberculosis. By ALLEN K. KRAUSE, M.D. Baltimore: Williams & Wilkins Company. 1923.

These two volumes from the pen of one of our foremost and most brilliant students in tuberculosis are a welcome addition to the literature on the subject.

The first volume on "Rest and Other Things" is of very real help and value not only to those who are interested in tuberculosis or perhaps suffering from the disease itself, but to many of us who find this world at the present time at least a somewhat hectic and complex proposition.

Krause defines rest as "Relief from strain." This to me is by all means the most satisfactory definition of a much abused term that I have seen. To one person rest may mean sitting with hands folded, to another (and this applies to myself) rest means vigorous physical exercise, preferably with a rod or a gun. Relief from strain is not only needed by a consumptive, but by the rest of the world as well.

The other short essays in this little volume are of great practical value, and clear up many moot points. In that on "Sputum Infection of Children," he discusses various theories and comes to a sane and sound conclusion. In "Anti-tuberculosis Measures," he sounds an optimistic and a stimulating note. I quote his own words, "Nor is there room in the anti-tuberculosis movement for a single note of discouragement. The pessimists among us can be only those who are deficient in grasp and breadth. Civilization and tuberculosis are contemporaneous; the number of the tuberculous and the number of civilized beings are almost coequal: therefore, to despair of tuberculosis is to despair of civilization."

In the second volume, "Environment and Resistance in Tuberculosis," there are two essays, one on "Environment" and one on "Resistance." These are complex, scientific and deep observations of complex subjects. They are of value to the student and to the scientist, but will not help to any great degree the general public or the general practitioner. He makes an appreciation of his remarks far easier by frequent short and concise summaries, but at the best the problem is a difficult one. It is interesting to note that he takes a conservative attitude in regard to the well-known slogan, "Tuberculosis is not inherited," in admitting that although the disease itself is not inherited, something which plays an important part in the resistance of one person and the susceptibility of another is doubtless inherited. His remarks on the relationship of trauma to the subsequently developing tuberculosis are equally sane and sound. There is

much in this volume which to the average reader as well as to the reviewer is hard to appreciate and understand.

Current Literature Department.

ABSTRACTORS.

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JOHN S. HODGSON	JOHN B. SWIFT, JR.
FRED S. HOPKINS	WILDER TILSTON
	BRYANT D. WETHERELL

DOUBLE KIDNEY.

EISENDRATH (*Annals of Surg.*, April, 1923) defines accurately this condition, and presents an article of twenty-five pages profusely and beautifully illustrating the various pathological conditions coinciding with the condition which he is describing. The illustrations are of great interest and value, and very adequately describe the text.

[E. H. R.]

THE RELATIONSHIP BETWEEN CERTAIN FORMS OF INTESTINAL OBSTRUCTION, CHRONIC PERITONITIS, AND CHRONIC MULTIPLE SEROSITIS.

DOWD (*Annals of Surg.*, April, 1923) presents an interesting article illustrated by several very excellent plates showing the gross and microscopic pathology in these cases, and concludes as follows:

There are a few recorded cases of chronic peritonitis which has agglutinated the small intestines into relatively small globular masses.

The intestinal mucous membrane becomes puckered into folds and eventually occludes the intestinal lumen.

The outside appearance of this mass gives little indication of the real length of intestine which it contains. Four-fifths of the small intestine may be contracted into a mass which apparently contains about one-fifth.

The cause of this peritonitis is not definitely known, but it is believed to be due to a low grade of infection or to the toxins of such infection. In certain instances the inflammation may have been tuberculous.

There are many points of resemblance between this process and inflammation known as chronic multiple serositis. Indeed, similar intestinal peritonitis has in certain instances formed a part of chronic multiple serositis.

[E. H. R.]

THE EXPERIMENTAL PRODUCTION OF PEPTIC ULCER.

MANN and WILLIAMSON (*Annals of Surg.*, April, 1923) are working in the Division of Experimental Surgery and Pathology at the Mayo Foundation, and devised experiments for diverting the secretions which neutralize the gastric juice as it leaves the stomach to another portion of the intestine removed from the point of emergence of the acid. Under such conditions, typical sub-acute or chronic peptic ulcer, quite

comparable pathologically to that found in man, developed in the intestinal mucosa just adjacent to the gastric mucosa in a high percentage of cases.

The authors are not as yet in a position to make positive statements with regard to the development of, or the factors responsible for, the production of such ulcers. It should be emphasized, however, that the success of the method of producing ulcer was due to the presumption that the acid, or lack of alkali, is an important etiologic factor. Further experiments are being at present carried on to prove or disprove this theory.

The article is well illustrated with drawings and plates.

[E. H. R.]

LIGATION OF THE INFERIOR THYROID ARTERY.

DeCOURCY's (*Annals of Surg.*, April, 1923) first experience with ligation of the inferior thyroid artery in cases of thyrotoxicosis was that the operation was too major a procedure for these patients to stand, but more recently with greater experience he is led to believe that it is the operation of choice.

He feels that the ligation of all four thyroid arteries over a period of a few weeks must be condemned because of the dangers which it incurs. Tetany is very apt to occur, due to the removal of the blood supply to the parathyroid bodies and clinically a severe type of toxæmia sometimes follows the fourth ligation.

The following routine is followed at present: single or double superior ligation is performed at the first sitting; if single, the opposite side is usually ligated within the week following. The patient is then allowed to return home and is instructed to submit to almost absolute rest. After three or four months, the patient is again examined and, if thyroidectomy is still contraindicated, he ligates one inferior thyroid artery. This is usually all which is necessary before performing a complete thyroidectomy. If, however, a month passes after the inferior ligation, and the patient is still considered a bad risk for thyroidectomy, he then ligates the other inferior artery. This is performed from four to five months after the superior ligations, and it is felt that this is a sufficient time for a slight collateral circulation to form about the superior poles and prevents disastrous results which may otherwise follow.

Ligation of the inferior arteries lessens more the volume of blood to the gland than does superior ligation. Operation, it is claimed, can be performed in half the time which it takes to ligate the superior artery, frequently taking only five minutes. Incisions for the inferior ligation can be made in the same crease as the incision for thyroidectomy, and only one resulting scar remains.

The author has now performed inferior ligation sixty times with only one violent reaction. The technique is described in detail.

[E. H. R.]

THE JOURNAL OF METABOLIC RESEARCH, SEPTEMBER, 1922.

PEMBERTON, HENDRIX and CROUTER studied the blood gases in arthritics, and found that if the tolerance for glucose is lowered there tends to be a rise in the percentage saturation of the blood for oxygen; that the rate of blood flow seems to be less constant, and may reach lower figures than is the case in normals, but that they were not able to correlate the saturation with the changes in the rate of blood flow.

FRIEDENWALD, MARTINDALE, and KEARNEY studied the Lyon-Meltzer biliary drainage in animals, and concluded that magnesium sulphate quantitatively increased the flow of bile when applied locally to the duodenal mucous membrane near the gall-bladder.

opening; that contraction of the gall-bladder was absent in their series, and finally that offending organisms such as typhoid bacilli may be recovered by means of the tube.

Coxsby in a precise examination of serial sections of all parts of the pancreas in twelve cases of diabetes and twelve controls of the same age, found in the former group a marked reduction in the amount of insular tissue. The average number of islands per cross section was 74 as compared with 184 in the controls. Every case of diabetes showed more or less qualitative changes in the islands, chiefly hyalinization and fibrosis.

Brass studied the effects of insulin on diabetic dogs, and pointed out the possible interest for human treatment of his findings that in a totally depancreatized dog the identical dosage of insulin gave different results according to the plan of administration; when crowded into a period of five hours, it produced hypoglycemic collapse, even though the entire diet for the day was given within this period, and by 8 o'clock the following morning faint glycosuria had returned; but distribution throughout the 24 hours maintained good health without glycosuria, and with a fairly equable plasma sugar curve. [H. G.]

LYMPHANGIOMA OF THE NECK.

THOMPSON AND KEILLER (*Annals of Surgery*, April, 1923) give a very thorough historical review of the embryology and pathology of this condition. They speak of it as an extremely rare disease, but one which follows certain anatomical landmarks a 1 lines which should make its surgical removal more simple if these are taken into consideration. These tumors are primarily benign, and rapid growth—which often takes place—does not indicate malignant transformation. They may, and frequently do, contain a large haemangiomatic element. In all cases, especially the cystic forms, they are more deeply set than a superficial inspection would lead one to suppose, and their deep relations and extensions follow certain definite lines predetermined by their embryonic origin, and not the result of infiltrative tumor growth. They present two case histories which are instructive. [E. H. R.]

ACQUIRED STRICTURE OF THE MALE URETER.

HERBST and THOMPSON (*Jour. of Urology*, February, 1923) place emphasis on the male ureter in this paper, as they consider only strictures at the lower end of the ureter caused by infections of the prostate and seminal vesicles. Pathologically, there are three degrees of obstruction: congestion, inflammatory type, fibrous stricture. The symptoms are the same as in prostatitis and seminal vesiculitis; the urine may show some blood, usually pus; the colon organism is most commonly the cause. Diagnosis is most reliable with a uretero-pyelogram. The treatment depends upon the degree of inflammation and obstruction. [B. D. W.]

CONSERVATIVE RENAL SURGERY ASSOCIATED WITH URETERAL STRICTURE WORK.

HENNER (*Jour. of Urology*, February, 1923) gives ten cases in detail with very good illustrations of pyelo-ureterograms, pointing out where the wax-tipped buds held up. Many cases of large hydronephroses, and apparently even more serious infections, have been restored to sterile urine and good function after simple dilatation of the stricture with the establishment of good drainage. The author uses Nos. 7, 8, and 9 ureteral catheters in adults.

Fascial bands (binding the ureter), ptosis (allowing sagging), may interfere with giving perfect results from dilatation alone, and have to be dealt with accordingly. The author feels that more dilatation would save many operations that are now deemed necessary. [B. D. W.]

ACCIDENTAL BILATERAL OCCLUSION OF THE URETERS.

HERMAN (*Jour. of Urology*, February, 1923) writes: Bilateral occlusion of the ureters is an extremely rare accident in pelvic surgery. A case is here given in detail following a hysterectomy. When Barney, in 1912, reviewed the literature, a total of 16 cases only could be found. G. G. Smith reports two cases of bilateral ligation of ureters. This paper reports a series of 24 cases, in 15 of which the occlusion was due to encircling ligatures. Pelvic exudate following the application of the Percy cautery completely obstructed both ureters in two cases. In two others the ureters were caught in vaginal clamps; in another the right ureter was severed, the left ligated. The symptoms are enuria, uremia.

The obstructed ureter has little tendency to open without operation, and we know of no instance of bilateral occlusion that was relieved spontaneously. In cases where the ureter has been dissected free and clamped, there is discussion whether it is better to do a uretero-vesical anastomosis immediately or to wait, after removing the clamps, until there is evidence of fistula, and then when it appears to do a uretero-vesical anastomosis.

There are ten cases of bilateral ureteral obstruction in which double nephrostomy was performed; nine of these were double ligation, and one followed the application of the Percy cautery to a malignant cervix. The results seemed to condemn nephrostomy as exceedingly dangerous and rarely successful. The writer feels that the operative method of choice, in cases of accidental bilateral occlusion of the ureters due to ligatures, embraces transperitoneal exposure of the ureters at the site of injury and deligation; or, if this proves to be impracticable, uretero-ureteral or uretero-vesical anastomosis. Of course, one would hesitate if the primary operation were complicated by peritonitis; nephrostomy is to be preferred, too, in the presence of symptoms strongly suggestive of pyelonephritis. The 24 cases are then given in brief with results. [B. D. W.]

NEW SERUM REACTIONS IN SYPHILIS.

HAJÓS and HOFFHAUSER, from Korányi's third medical clinic at the Royal Hungarian University in Budapest, present (*Wien. klin. Woch.*, March 1, 1923) their studies of the new Meinelcke and Dold serum reactions in syphilis. They find that these tests are less sensitive than the Wassermann, but more specific. With formal control, the Dold reaction is more specific than the Meinelcke. Both should always be employed as a completion and check of the Wassermann. [R. M. G.]

PRESENT STATUS OF METALUES.

Under the name of metalues, PROFESSOR REHLICH discusses (*Wien. klin. Woch.*, March 8-15, 1923) the question of the relation of the parasymphilitic affections to primary lues. He sketches the history of the parasymphilitic diseases and the gradual development of knowledge of their nature. Of the etiology of these diseases there is no further debate, but it is still undetermined whether they are due to the direct action of spirochetal growth or to the operation of a virus or ectotoxin. [R. M. G.]

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IS DENTAL CARIES AVOIDABLE UNDER PRESENT DIETARY CONDITIONS?

It is only among races that live on natural foods that no dental caries is found. The meat and fish eating Esquiman and the vegetarian Moro are equally free from it. Immigrants recently arrived from countries where food is eaten at or near the source of production, and with very little manipulation, have almost no caries. After a few years on our diet, they usually show marked degeneration of tooth structure.

In urban communities in this country caries is almost universal. Probably more men are to-day engaged in repairing its ravages than in treating any other one pathological condition. In England it is so prevalent that a medical dental commission under government auspices has been appointed to look into its cause.

For the last forty years the efforts of the dental practitioner have been concentrated on cleaning and filling teeth. His work has been based on the theory of Miller, that caries is due to the fermentation by bacteria of carbohydrate material adhering to the surfaces of the teeth, with production of lactic acid. Inasmuch as very

little progress toward the elimination of caries has been made in this direction, and since it is evident that various races differ markedly in susceptibility to caries, it seems reasonable to conclude that something more than a purely local condition is responsible for the prevalence of this disease.

The large amount of experimental work carried on in recent years, in an effort to show what foods are best adapted to the promotion of health, has had results which are interesting and suggestive to those concerned with the problem of dental decay. In England, Mrs. Mellanby observed defective teeth in pups which her husband was feeding a rachitic diet. She produced irregularities of the teeth, delayed dentition, and defective enamel and dentine by a diet deficient in fat-soluble A ("or something with a similar distribution"). Zilra and Wells obtained histological changes in the teeth of guinea-pigs by scorbutic feeding. Howe obtained decalcification of the teeth of guinea-pigs by diets in which the ration of green stuff was reduced to a minimum, and produced caries in a few instances in monkeys whose diet was deficient in the anti-scorbutic vitamin only, and in others whose diet was deficient in both the anti-scorbutic vitamin and calcium. McCollum's experimental rats (as reported by Grieves) showed "caries-like defects," the largest number of defects being formed when the protein was of a poor quality, and when, at the same time, the diets were deficient in calcium and in fat-soluble A.

Sherman has stated that modern diets are not likely to be deficient in protein, but are probably more deficient in calcium than in anything else. This would seem to be in accord with the findings in experimental work, where defective teeth are most frequently obtained when the calcium content of the food is low or when the vitamins, which apparently are directly concerned with successful calcium metabolism, are deficient. Holt, Courtney, and Fales have calculated that the calcium requirement of the growing child is three or four times that of the adult, and it is to be remembered that during this time the permanent teeth are calcifying.

The question then arises why modern diets should be more deficient in calcium and the vitamins than the simpler diets of primitive races. The milling of cereals with loss of calcium and of the water-soluble vitamin, and the pasteurization of milk with the possible loss of the anti-scorbutic and other vitamins are two cases in point. The storing of foods for long periods, undoubtedly, results in degeneration of some of the vital elements. Long cooking of most vegetables and meats destroys the anti-scorbutic vitamin and boiling causes a loss of calcium and other salts into the water.

Familiar as these points are to all nutrition workers, their significance in the matter of developing and preserving sound teeth has not

been grasped. In an article in the *British Dental Journal* for April 16, 1923, Bibby attempts to show that the races which have no decay are those whose diet contains sufficient calcium, available for use in the body, i.e., it must be composed largely of foods which give a basic ash, so that the calcium present will not be required to neutralize acidity, but may be utilized in the bones and teeth. He contends that the Scottish Highlanders, the Irish and Polish peasantry, the Indians, Chinese, and Japanese, all have good teeth because they eat less meat than we do, and more vegetables and fruits, "in many cases supplemented by milk." Wheat, which is most used of all the cereals, has an ash of the highest acidity. Vegetables and fruits, which have a basic ash, should be used liberally to supplement a cereal and meat diet.

It is, of course, not possible or desirable to attempt to imitate the living conditions of primitive races. Milk will continue to be pasteurized, but orange juice may be used to supply the vitamins lost in the process. White bread will probably remain in favor, but the coarser breads also are gradually coming into general use. Particularly to be emphasized is the importance of a freer use of the lime-containing foods, milk and fresh vegetables. The latter not only supply lime and vitamins, but by their bulk help to increase peristalsis in the intestine, and thereby better absorption of food elements and elimination of waste.

It would seem that even in cities, under present conditions, it is possible to have and keep sound teeth. It is only necessary to choose intelligently from the great variety of foods available.

THE INHERITABILITY OF CANCER.

The value of long-continued, patient research is admirably demonstrated by the work of Dr. Maud Slye on the transmission of mouse tumor by inheritance. For over twelve years she has studied this question by means of the inbreeding and cross-breeding of various strains of mice, deriving her conclusions from observations on more than 21,000 individual animals. These conclusions are given in a very convincing paper in the *Journal of Cancer Research* for April, 1922. ("Biological Evidence for the Inheritability of Cancer in Man," *Journal of Cancer Research*, Vol. vii, No. 2, pages 107-146.)

Breeding experiments carried through many generations of mice show that the tendency to cancer formation is a transmissible characteristic which in every way conforms to the Mendelian laws. The writer finds that carcinoma and non-carcinoma tendencies segregate out and are transmitted as such; that sarcoma and non-sarcoma tendencies segregate out and are transmitted as such; that a specificity of tissue type in specific organs segregates out and is trans-

mitted as such, so that an organ either has or lacks the non-cancer mechanism. These inheritance units, as has been said, are distributed in the offspring in exactly the same way as albinism, for example, is distributed. The mechanism which prevents cancer is dominant; the tendency to cancer is recessive. When two dominants are mated, their descendants never develop cancer. Dr. Slye has followed such a strain for fifteen generations, without finding one case of cancer. In a typical strain of mated recessives, every individual for six generations showed either cancer, sarcoma, or pseudoleukemia, which Dr. Slye believes to be a form of malignant disease. In the heterozygous line,—that is, in those mice in which both the cancerous and the non-cancerous tendencies are combined,—cancer never appears in the first generation, since the tendency to cancer is not dominant, but is recessive. It may not appear until the sixth or seventh generation, depending upon the individuals with which the heterozygous animals are mated. "By the right selective breeding in any heterozygous line, neoplasms can be made to occur or can be held off at will" (p. 121).

It would seem that Dr. Slye has definitely proved that the tendency to cancer and the susceptibility of certain organs to tissue change are true inheritance units. As she very properly points out, if these characteristics are transmissible in mice, they must be equally so in man, for the laws of inheritance are the same in all living things, whether they are peas, mice, or men. The fact that apparently isolated cases of cancer occur in human families does not invalidate this theory, for it is usually impossible to trace the pathological heritage of any individual through all his ancestry for six or seven generations.

The obvious inference from this important research is that, as Dr. Slye says, "there is, therefore, a ready and certain genetic method of escape from cancer for the individual and for the race" (p. 145). Theoretically, there is, but practically it would be very difficult to be sure that those who have a cancerous inheritance, and are therefore heterozygous, do not mate with similarly constituted individuals. Perhaps certain conspicuous examples of such a mating could be warned of the danger to their offspring. At any rate, the lesson taught us by Dr. Slye gives us one more point from which to attack the cancer problem.

PRESENT-DAY TRENDS IN MEDICAL TEACHING.

It would be trite to say that medicine has become a much more complex subject than it was a generation ago. Nevertheless it must be constantly borne in mind that this extreme complexity has a very definite bearing on the teach-

ing of medicine, increasing its difficulties many times. The days of the great clinicians—the great teachers of purely clinical medicine—are past, or almost past. We have no longer our Bigelows, our James Jacksons or our Lewises. Boston, in the practice and the teaching of medicine has had a mighty past, but in our contemplation and our admiration of that past we must not neglect to reckon with the present or to construct the future.

Whereas, formerly, in one or two small hospitals, under the guidance of a few eminent practising clinicians, the student was himself taught to be a skilful practitioner, imbibing unquestioningly the doctrines handed on to him by his preceptors, now, in many hospitals and laboratories he is taught as far as may be to reason for himself, and he must decide whether he will be practitioner, general or in a specialty; an investigator, a public sanitarian or an executive. This, however, is not the only task that the school must perform, for as well as training its students to cultivate in the best possible manner the fields they have selected for themselves, it must itself produce original work and advances in the science of medicine and maintain its prestige and its position, always competitive, in the march of events.

In order to present a solid front, a unity of ideas and of goals to be attained, a considerable degree of coordination must exist between the various departments of the institution. A medical school is not, after all, unlike any great business with its general manager, its departments, and its heads of departments. The business of a medical school may be divided into three branches of equal importance, and the jealousies which exist too often between them need not exist. On the one hand we have the research department, on the other hand the clinical department, and between them and coordinating them is the executive or administrative branch. These three, as we have said, are of equal importance, and there need be no jealousies existing between them if those individuals best suited to their special departments are allowed to remain in them. Obviously it is unfair, both to the individual and to the school to take that rarest of mortals, a born scientific investigator, who should be left to do his own work in his own way, and attempt to fit him into an administrative or a clinical position for which he has no particular liking or ability.

In any discussion of this nature the fact must not be lost to sight that the first duty of a school is to teach and the first duty of a hospital is to care for the sick; its functions as a teaching and as a research center must be secondary.

True ability in the administration of a department in a medical school or of a service in a hospital is the ability to develop men to the highest degree of their usefulness, and it is by

this development of individuals that the success of a medical center will be measured. Boston, with its medical schools, laboratories and hospitals has not been generally wanting in this respect, but instances could be cited where departments have done good routine teaching for years without the development of men capable of carrying on the work or of extending the frontiers of knowledge in their fields. We must reverence our past but we must not worship it, for a single inspired vision into the future is worth many a fond glance backwards.

THE ROCKEFELLER FOUNDATION.

PRESIDENT VINCENT, in the latest report from the Rockefeller Foundation, deals largely with the International Health Board, laying special emphasis upon the training of health staffs, campaigns against yellow fever, malaria and hookworm disease, and the promotion of international hygiene. He says in part:

"The too prevalent idea that any practising physician can discharge the duties of a health officer needs to be vigorously combated. . . . The International Health Board has welcomed opportunities to co-operate in establishing schools of public health. . . . The Foundation has contributed or pledged nearly \$10,000,000 to such institutions throughout the world.

"The program for 1922 included 34 county-wide malaria control demonstrations and 32 town demonstrations in ten states. It has been conclusively shown that under normal conditions an average community can practically rid itself of malaria at a per capita cost of from 45 cents to \$1 per year."

In regard to the promotion of international hygiene, President Vincent says:

"It must be owned that there is today a suggestion of irony in smooth phrases about co-operation, understanding, and good-will among the nations. Suspicion, distrust, detraction, hatred, and threat of war are all too prevalent in the relations of the peoples of the world. Scientific comradeship and common tasks of hygiene seem almost negligible as bonds of unity. But the difficulty of a task is no excuse for not attempting it. Because it is not possible to predict the early dawn of a millennial peace, there is no good reason for not taking steps which seem to lead toward even a remote era when nations may substitute generous rivalry for deadly conflict. To stimulate world-wide research, to aid the diffusion of knowledge, to multiply personal contacts, to encourage co-operation in medical education and public health are the means by which the Rockefeller Foundation seeks to be true to its chartered purpose, which is to promote, not the exclusive prosperity of any one nation, but 'the well-being of mankind throughout the world.'"

THE ANNUAL MEETING OF THE MASSACHUSETTS MEDICAL SOCIETY.

For the third time the Society has met in Pittsfield for the annual meeting, being previously entertained in 1852 and 1863.

The attendance was larger than was anticipated and every district was well represented. Three hundred and twenty-one Fellows registered.

A very pleasant feature was the presence of the ladies. A wife is usually an important factor in the success of a physician, and the provisions for the entertainment of the ladies added to the pleasures of the meetings. The weather was all that could be desired, and although the hills were obscured by a smoky haze, the beauties of the Berkshires could not be wholly hidden.

The section meetings were well attended, for the attractive programs kept the doctors from participating in outside activities to any large degree, except at times when the scientific discussions were not being carried on.

Each section competed with the others in the attractions presented, for in addition to papers by eminent men in our own State, everybody wanted to hear Longcope of Baltimore, Thompson and Gibson of New York, Polak of Brooklyn, Bushnell, formerly of the U. S. A., and Shields and McPherson of New York.

Unlike conditions in some former years, internal medicine played no second part to surgery, for the great outstanding matter of interest of the present year made a large number anxious to know more about insulin. The clear, concise and almost dramatic language of Dr. Joslin, when he said in substance that the correct use of insulin is a test of the intelligence of the general practitioner, was impressive.

The new section of obstetrics and gynecology constituted an important advance in the activities of the Society, and the large attendance (about one hundred and thirty) demonstrated that this section will meet a definite demand. The chairman, Dr. Mongan, announced that he hopes to have inaugurated a plan for the employment of a paid secretary to act under this section in securing information relating to the practice of obstetrics and gynecology and the more or less regular publicity of all matters of interest to physicians relating to these subjects.

The Shattuck Lecture, by Dr. Dean Lewis of Chicago, was a clear exposition of the pathology of damaged nerve structures and the methods of repair and reconstruction. This paper was especially interesting to neurologists and surgeons dealing with these problems.

In the annual oration, Dr. Roger I. Lee presented many original ideas relating to the necessity for and the results of physical examinations. This address was not only instructive

but intensely interesting, for it was presented in classical language and yet so clearly put that every thought was easily grasped, and it was the consensus of opinion that this oration will stand as one of the best ever delivered.

THE COUNCIL MEETING.

The attendance compared favorably with that of many meetings which have been held in Boston. The reports of most of the committees were approved. The Committee on Public Health did not seem to be agreed on some matters, because the two resolutions presented were not in accord. There was some misunderstanding concerning the report of the committee appointed to consider clinical meetings, for the fear was expressed that the resolution offered was mandatory and would tend to lead the district societies to feel that the parent Society was ambitious to exercise a paternalistic domination over the districts. It was also generally understood that there would be opposition to broadcasting news of medical affairs. These feelings led to tabling of the recommendations of the committee. Dr. Mongan, however, at the regular meeting of the Society the next morning, introduced a motion setting forth that the parent Society approves of the general plan of clinical meetings to be arranged by the districts. This motion was passed.

The Nominating Committee presented the following names of persons for officers for the ensuing year:

For President: Enos Hoyt Bigelow of Framingham.

For Vice-President: Ayres Phillip Merrill of Pittsfield.

For Secretary: Walter Lincoln Burrage of Brookline.

For Treasurer: Arthur Kingsbury Stone of Framingham.

For Librarian Emeritus: Edwin Howard Brigham of Brookline.

For Orator: James Savage Stone of Boston. These Fellows were elected.

The full details of this meeting will be published in the Proceedings of the Council in an early number.

The Society passed a vote of thanks to, and appreciation of the service rendered by, the Berkshire District Society. This formal action does not convey an adequate appreciation of the indefatigable labors of the District Society and the local committee appointed to carry out the details of the meetings. To Dr. A. P. Merrill is due to a large degree the carefully arranged details. He was in evidence every moment from the time of the arrival to that of the departure of the guests and in the most gracious and cordial manner represented his Society in providing for every detail. He was ably seconded by Dr. P. J. Sullivan, who looked

after the assignment of rooms in the different hotels. If it had not been for these two men there would have been much confusion, for the hotel managements could hardly have paid proper attention to many of these details, although they, too, were solicitous of the welfare of their guests. The ladies of Pittsfield supplemented the work of the men in providing for a series of entertainments for the wives, daughters and other members of the doctors' families.

Taken all in all, the occasion was much like a great house party where hosts and guests were in cordial harmony. The writer has attended all of the annual meetings, with one exception, for the past forty years and cannot remember witnessing the degree of satisfaction apparent among those in attendance at Pittsfield.

It has been demonstrated that although no meeting outside of Boston may ever have so large numbers as may attend in the capital city, the occasional meeting outside of Boston will accomplish a great deal in promoting the influence and solidarity of the Society. Those who were unable to attend missed a great deal.

THE ANNUAL DINNER.

Two hundred and eighty-two Fellows secured tickets for the annual dinner, which was served in the large dining hall. After the inner man had been abundantly cared for the President called the assembly to order and gave a history of the medical activities of the western section of the State, which, beginning in 1785, culminated in a meeting in 1787 of an independent medical society. The next meeting was in 1788, the year of Shays's rebellion, after which there is no further chronicle until 1794, and in 1807 the Massachusetts Medical Society issued a special grant for a district society. There is little mention of regular meetings until 1817 or 1818. The formation of this district society was antedated by the creation of societies of Essex South and Worcester in 1807. Dr. Bartol paid a glowing tribute to the activities of the Berkshire District in providing for this meeting under the presidency of Dr. Colt, and especially the subcommittee under Dr. Merrill. He then called upon the Honorable Charles W. Power, Mayor of Pittsfield, who extended warm greetings to the Society and expressed the hope that the attractions of the Berkshires would lead to future meetings in this section. He spoke of the advanced stand taken by Pittsfield in public health matters and reported drives of \$150,000 and \$250,000 for two of the hospitals.

Introducing Dr. H. A. Garfield, President of Williams College, the President gave a history of the Berkshire Medical College, which was affiliated with Williams. Dr. Garfield further explained the relation of the two institutions and paid a tribute to Dr. Mark Hopkins, the former President of Williams, who was not only

a doctor of medicine but who had conferred upon him other doctorate degrees, and also spoke at length of the great service of Dr. Charles Dewey, who had degrees in medicine, theology and other departments of education; making the point that general education and experience fitted a man for the broader work of the general practitioner. His allusion to the restricted work of the specialist was witty and apt.

Congressman Allen T. Treadway was next introduced, who gave a detailed account of the activities of the Government in providing for the veterans of the World War through the Public Health Service and organizations under the supervision of this department. He also gave interesting details of his association with eminent men in Congress and spoke feelingly of some of the great men with whom he had been associated who have passed away.

In introducing ex-State Senator Thomas F. Cassidy, the President appealed to him to advise the medical profession as to the ways of avoiding legal entanglements. Mr. Cassidy made his points by the use of appropriate anecdotes and cautioned medical men when appearing in court to avoid technical language and explain matters in a way which would be clearly comprehended by the laity.

The newly elected President, Dr. Enos H. Bigelow, was introduced, who, after appropriate remarks, brought the exercises to a close.

The President, Enos Hoyt Bigelow, M.D., was born in Framingham, Massachusetts, in 1853. After attending the public schools of that town he entered the Worcester Polytechnic Institute, graduating in 1875, and after graduation entered the Harvard Medical School. After one year he temporarily abandoned his medical studies and engaged in business, but after a short period he reentered the Harvard Medical School, graduating in 1882.

He has been connected with the Framingham Hospital for many years, relinquishing active service at the usual age of retirement. He has been chairman of the Standing Committee on Public Health of the Massachusetts Medical Society for a series of years.

With no spirit of apprehension for the future and with full confidence in the ability of the incoming President, it is fitting to place on record the often-repeated expression of appreciation of the distinguished service of ex-President John W. Bartol. Coming into office at a time when men were under strain and affairs were in an unsettled condition, in common with many human activities, he has succeeded, partly by reason of good judgment, partly by patience, and always under the stimulus of high ideals, in welding the Society into a harmonious body of scientific workers, all stimulated by a common and honorable ambition to render the greatest possible service to humanity. His adminis-

tration will stand in the history of the Society as an example to be followed by all future Presidents.

FIRST-AID CAR.

THE American Red Cross is about to put in service a Pullman car reconditioned and equipped to be used in demonstrating first-aid work. A lecture room will accommodate an audience of fifty persons, and is so arranged that it can be quickly transformed into an emergency hospital with a capacity of thirty patients. It will carry a large supply of first-aid equipment and hospital supplies and surplus food. Two competent surgeons and their assistants will constitute the staff. The car will co-operate with Red Cross chapters in the various towns and cities in an effort to promote and organize first-aid classes in Y. M. C. A. and boy scout organizations, and in schools and colleges. The first trip will be over the Baltimore & Ohio system.

The Red Cross took up First-Aid work in 1899, and in the railroad campaign covered during the succeeding six years extended its service over 206,000 miles of railroad, gave 7,600 lectures and demonstrations, reaching over one million people. From 1910 to 1922, 164,121 persons took and completed a course of ten lessons, and received a Red Cross First-Aid certificate.

The instruction given has added tremendously to efficiency in dealing with accidents before the arrival of a doctor, and has often provided skillful assistants to physicians.

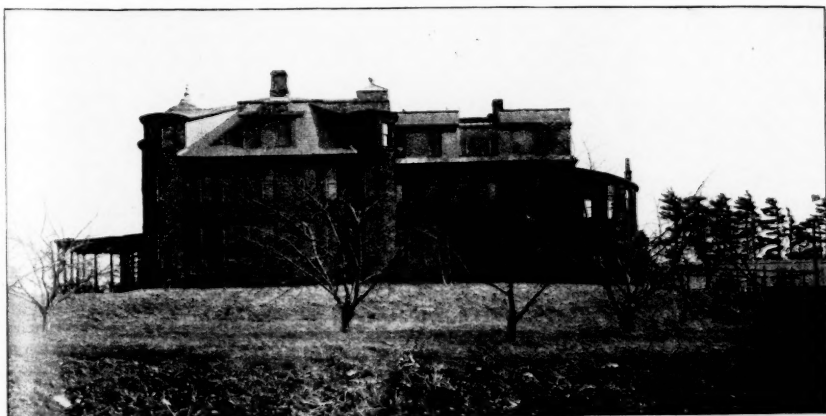
Miscellany.

NOTES FROM THE WORCESTER DISTRICT MEDICAL SOCIETY.

The Wachusett Medical Improvement Society met Wednesday evening, June 8, in Princeton, Dr. E. S. Lewis as host. Dr. F. E. Stowell, of Worcester, addressed the society on "The Scientific Aspects of Electrotherapy." Resolutions were adopted on the death of the late John P. Rand. The next meeting will be held Wednesday, July 11, at Dr. Washburn's camp, on Asnebumskit Lake, in Hubbardston. Swimming, fishing, boating, and a clambake will be indulged in, as well as a scientific program.

THE opening of the new Fairlawn Hospital occurred Memorial Day, May 30th. The following day it was ready to receive patients. The Fairlawn Hospital was formerly the Norcross Estate. It is a large brownstone building occupying a beautiful location on May Street, and is surrounded by 40 acres of well-kept land which allows for future development. This undertaking has, up to the present time, been supported by public-spirited Worcester citizens of Swedish nationality or descent.

Realizing the great need of increasing the hospital facilities in Worcester, a number of Swedish-speaking business and professional men got together and collected a fund of about \$50,000, which paid for the estate; some time later an additional \$50,000 was raised among the Swedish-speaking people, said sum to pay for the alterations and equipment. The hospital has a capacity of fifty beds and will be open to all nationalities and denominations.



New Fairlawn Hospital at Worcester, Recently Opened through the Efforts of the Swedish-Speaking People of Worcester and Vicinity.

It will be an open hospital for medical and obstetrical cases, but closed surgically. The staff is now being formed, and will be announced later.

AN APPEAL FOR SUPPORT OF A WORTHY OBJECT.

The following invitation has been sent to the alumni of the Harvard Medical School and should be met generously:

HARVARD UNIVERSITY MEDICAL SCHOOL.
BOSTON, MASSACHUSETTS.

April 30, 1923.

Friends of the late Professor Harold C. Ernst propose to establish a Memorial to him. Owing to the fact that the Medical School Library needs to expand, this project has taken the form of the equipment of an additional room in the Administration Building of the Medical School, to be known as the *Harold C. Ernst Room*. The occasion will be the transfer of Dr. Ernst's private medical library to the School. The following persons have consented to serve as a committee to raise funds: Dr. John Collins Warren, Dr. William Sturgis Bigelow, Dr. Edward H. Bradford, Dr. Walter B. Cannon, Dr. Henry A. Christian, Dr. S. Burt Wolbach, and Emor H. Harding, Secretary of the Class of 1876, Harvard College, Dr. Ernst's class in college. Cyrus E. Dallin has promised to contribute a bas-relief portrait of Dr. Ernst from studies which he made of him in 1918.

The committee earnestly hopes that the opportunity of recognizing Dr. Ernst's services to medicine and to the Medical School in this practical form will make a strong appeal to the alumni of the Medical School and to Dr. Ernst's personal friends. The committee proposes to collect a sum of money sufficient to establish a fund for purchasing books, to be known as the *Harold C. Ernst Book Fund*, in addition to the amount necessary for the making of alterations and repairs in the new room. It is estimated that the structural changes will not cost over five thousand dollars, and it is hoped that at least ten thousand dollars may be set aside for the Book Fund.

Should you care to contribute, make your check payable to the Harold C. Ernst Fund and send it to Dr. S. Burt Wolbach, at the Harvard Medical School, Boston.

NOTES FROM THE BOSTON MEDICAL LIBRARY.

Miss M. E. Campbell, who has been in charge of Holmes Hall for the past six years, has left for Peking, China, where she is to be librarian

of the Peking Union Medical College. Miss Dorothy B. Spear, formerly branch librarian of the Somerville Public Library, is now in charge of the reading room.

Through the kindness of two of its members, the Library has received two very interesting items: A copy of Begellardus, P. *De ergritudinibus infantum*, Venice 1487, the second edition of the first Renaissance contribution to pediatrics; and an autograph prescription of Dr. R. T. H. Laennec, the discoverer of auscultation, dated April 17, 1809. The prescription calls for extract of hemlock and acetate of lead to be used for "dissolving" lymphatic glands.

A complete set of the *Berichte der deutschen chemischen Gesellschaft 1868-1922* has been received and made available for reference.

News Items.

CHANGE OF OFFICE.—Dr. Mark H. Wentworth has removed to 2 Elm Street, Concord.

THE NATIONAL LEAGUE OF NURSING EDUCATION is meeting this week from June 18-22, at the New Ocean House, Swampscott. The Rockefeller Report is coming up for discussion.

RED CROSS SENT RELIEF TO AMERICAN CAPTIVES.—The Red Cross sent two thousand dollars to the China Central Committee to reimburse the committee for work done in relieving the captives of the Chinese bandits.

MASSACHUSETTS STATE NURSES ASSOCIATION.—This Association met at the Lecture Hall of the Boston Public Library, June 16, 1923. Miss M. C. Crawford spoke on "Publicity," in the morning, and Miss Adda Eldridge on "The Value of the Work of the Educational Director," in the afternoon.

THE WESSON MATERNITY HOSPITAL.—The report comes from Springfield that this hospital has put on record case number 11,000. During the past three years mothers have been given 40,812, and infants have received 39,373 days of care. The differences being accounted for by still births and infants which did not survive. There were 30 cases of twins, and one of triplets, during this period. Cesarean section was done 34 times. Up to June 1, 400 cases have been admitted this year. The shortage of nurses has seriously interfered with the function of this hospital. It is worthy of note that the medical service of this hospital has been conducted by independent physicians, for there is no regular medical staff, and yet this public institution has been a continued success.

WEEK'S DEATH RATE IN BOSTON.—During the week ending June 2, 1923, the number of deaths reported was 205, against 193 last year, with a rate of 13.87. There were 26 deaths under one year of age, against 18 last year. The number of cases of principal reportable diseases were: Diphtheria, 73; scarlet fever, 84; measles, 306; whooping cough, 19; tuberculosis, 33. Included in the above were the following cases of non-residents: Diphtheria, 3; scarlet fever, 9; measles, 4; tuberculosis, 3. Total deaths from these diseases were: Diphtheria, 2; scarlet fever, 2; measles, 2; whooping cough, 3; tuberculosis, 17. Included in the above was the following case of a non-resident: Tuberculosis, 1.

During the week ending June 9, the number of deaths reported was 233, against 164 last year, with a rate of 15.77. There were 32 deaths under one year of age, against 25 last year. The number of cases of principal reportable diseases were: Diphtheria, 58; scarlet fever, 98; measles, 203; whooping cough, 25; typhoid fever, 3; tuberculosis, 49. Included in the above were the following cases of non-residents: Diphtheria, 7; scarlet fever, 15; tuberculosis, 4. Total deaths from these diseases were: Diphtheria, 7; scarlet fever, 1; whooping cough, 1; tuberculosis, 19. Included in the above were the following cases of non-residents: Diphtheria, 3; scarlet fever, 1; tuberculosis, 3.

Obituary.

GEORGE DANFORTH BLISS, M.D.

DR. GEORGE D. BLISS, a well-known surgeon of Boston, and an incorporator and director of the Dorchester Savings Bank, died June 7, 1923, at the Johns Hopkins Hospital, Baltimore, Md. He had gone to Baltimore, accompanied by his brother, Frederic W. Bliss, a week previous. Born in Rehoboth in 1855, son of Cyrus W. and Hannah T. (Munroe) Bliss, he was a descendant of Richard Warren of the Mayflower. He was graduated from the East Greenwich Academy in Rhode Island. He received his M.D. degree from the Boston University School of Medicine in 1881. He next took up post-graduate work in the Harvard Medical School. He had been connected with surgical clinics in London, Berlin, Vienna, New York, Philadelphia and Chicago.

He practised in Boston after 1882 as a specialist in obstetrics and gynecology. He was an assistant surgeon at the Boothby Surgical Hospital and surgeon at the Massachusetts Homoeopathic Dispensary, where he was an obstetrician and also a specialist in obstetrics and gynecology. He was a member of the Massachusetts Homoeopathic Medical Society, of which he had been vice-president, and of the Massachusetts Medical Society, his name having been placed on the

retired list of that society in 1921. He was also a member of the Boston City Club, and a Mason. Dr. Bliss contributed numerous papers to medical magazines and reviews.

Correspondence.

COURSE IN VITAL STATISTICS.

June 5, 1923.

Mr. Editor:

At the suggestion of Dr. George T. Palmer, newly appointed Director of Research for the American Child Health Organization, the Department of Biology and Public Health of the Massachusetts Institute of Technology has decided to offer a course in Vital Statistics at its summer session for public health nurses, social service workers and others who may be interested. We believe that a thorough training in the fundamentals of vital statistics and record keeping is exceedingly important to all health workers, and anything you can do to bring this announcement to the attention of public health nurses and other health workers and to encourage enrollment will be greatly appreciated.

The course will begin on July 9 and will continue until July 27. Classes will be held daily, excepting Saturdays, from 2 to 4 in the afternoon. The fee will be \$30.

The course will consider the use of statistics in public health work, their value, the methods of analysis and the proper interpretation of public health statistical data. Emphasis will be placed on the methods for estimating and computing populations, death rates, birth rates, specific death rates and infant mortality rates. Sufficient training will be given in the compilation of suitable statistical tables. Special reports dealing with tuberculosis, infant mortality, housing, nutrition and various diseases will be critically analyzed and discussed. Other statistical items such as the graphic representation of statistical data and the proper correlation of available data will also be emphasized.

We believe a course similar to that outlined above will be very helpful to many public health workers and we hope it will enlist your co-operation and active support.

Sincerely yours,

MURRAY P. HORWOOD.

Massachusetts Institute of Technology,

Department of Biology and Public Health.

THE MEDICAL CADUCEUS.

Mr. Editor:

The mild controversy that is gently raging concerning the use of the Caduceus of the American Medical Association as an automobile emblem is of some interest. It may serve its use, however, in advertising the emblem, and it is apparent that the emblem is appearing on our streets in ever-increasing numbers.

It is unfortunate perhaps that, as has been suggested, the emblem is not truly heraldic in character. This, however, may be included among the minor inconsistencies of our generation. Certain facts should be considered. With our increasing traffic problems it is of value that the doctor's car should receive some courteous consideration from the police. The ubiquitous green cross has been more or less officially discredited by them. The Caduceus is the insignia of the medical corps of the United States Army; whether properly or improperly is of little present importance; and it is sold only to physicians by the American Medical Association. Many thousands have been sold and purchased; its significance has

been recognized in many localities, and its recognition has been promised by the Boston police and the Massachusetts Highway Commission; a recognition which is now in the slow process of evolution. It has taken two years slowly to popularize this emblem. Can we not, even if physicians, be practical, and recognize the value of the bird in hand? Let us bromidize our jarred esthetic senses and accept the inevitable, which, after all, may serve some useful purpose.

JOSEPH GARLAND.

THE PHYSICIANS' AUTO INSIGNIA.

Mr. Editor:

In connection with the auto insignia question, allow me to reproduce a card which I received today:
"33 Ash St., Manchester, N. H. 6, 9, 1923.

"In this A.M. Boston Post I see you M.D.'s are not agreed on the Auto Insignia you ought to adopt. I am a clairvoyant medium, descendant from Highlands of Scotland.—A white cross on a green surface is correct. White cross for sickness, Black for death. The Serpent design shown, should have head and neck much larger. It's one of my death signs."

Cheerful idea, isn't it?

Seriously, whatever insignia we adopt should be (1) distributed by the Massachusetts Medical Society through its District Societies; (2) sold only to practising physicians; (3) used only while the car is in actual professional use, and therefore (4) easily detachable. A badge attached to the radiator cap would meet the requirements, as each doctor could keep a plain cap as well; but this would interfere with the use of a motometer. A badge which could be attached to the windshield by some means, such as a rod passing through a hole and held on the inside by a thumb-screw, seems to me feasible; has any one a better suggestion?

HAROLD BOWDITCH.

ETIOLOGY AND PROPHYLAXIS OF GOITER.

Geneva, May 20, 1923.

Mr. Editor:

During the year 1921 the Swiss Department of the Interior appointed a commission composed of physicians and surgeons of note to again take up the study—interrupted by the war—of the various questions relating to the etiology and prophylaxis of goiter. The commission set to work at once and it was soon found that the solution of the problems raised by the etiology and pathogenesis still remains undecided in spite of the numerous publications of which it has been the object, and that the question of treatment itself has progressed little.

But if the purely scientific elements of these various problems are examined it would appear that from the practical viewpoint, certain definite results have been acquired. Precise experiments, based on conclusive observations made by numerous Swiss practitioners, have shown that one may now carry out an efficacious prophylaxis of goiter and that there is good reason to hope that by the judicious and systematic application of certain measures future generations may be freed from this endemic morbid process. You know how endemic goiter is throughout Switzerland, and its repercussion on public health, so that it is needless to insist on the importance of this result. This prophylaxis is applied in two ways, one being very limited and especially directed to schools, the second general, applied to the entire population.

From the researches carried out on school children in various parts of the country, particularly in the larger centres such as Zurich, Bâle, St. Gall, Berne and elsewhere, it has been found that without much difficulty or danger, and by very simple measures children can be cured of goiter. To accomplish this, all that is necessary is to take a tablet of one half

to one milligramme of iodine once a week, and whenever this treatment has been carried out astonishing results have been obtained.

However, goiter is not an affection of school-children; school life does not cause it to develop, because numerous children are already goitrous before school age. Hence, prophylaxis should be begun very early in life and continued long after the child has left school, because it has been found that subjects who were freed from their goiter during school life by prophylactic treatment, later on in life developed the process because this treatment had been given up too soon. Therefore in order to obtain really useful results a general permanent prophylaxis with iodine must be maintained in regions where goiter is endemic. As Professor Rœx, of Lausanne, stated, iodine must be exhibited in very early life and given during the entire life of the individual. And this is not an impossibility.

The researches inaugurated by Dr. Bayard in the Canton of Valais and continued by Dr. Eggenberger in the Canton of Appenzel have demonstrated the utility and efficiency of the method, which consists of giving to populations where goiter is endemic the quantity of iodine of which they are in need, by mixing the drug with ordinary table salt, in a proportion of from 250 to 500 milligrammes to 100 kilogrammes of salt. Admitting that a subject consumes 5 kilogrammes of salt per year, the maximum of iodine ingested will be 25 milligrammes, or one half milligramme per week. It would seem that this minute quantity can be absorbed without any untoward effect and still be quite enough for prophylactic purposes.

The Commission, after having studied the subject from all points of view, decided to call attention of the cantonal health authorities to the two prophylactic procedures—school prophylaxis, general prophylaxis—and recommends the application of the measure whenever it may be judged useful and necessary. The choice of the procedure will depend upon local conditions, but prophylaxis by the ingestion of iodine in salt should be preferred in any region where there is the slightest extension of the endemic goiter.

The Commission has published the following instructions for mensuration of the thyroid. The thyroid of an adult living in a country exempt of goiter



FIG. 1.—Measurement of the Circumference at Base of Neck.

weighs from 20 to 30 grammes. The height of the lateral lobes measures from 5 to 6 cm., the entire width of the gland measures from 6 to 7 cm. The average weight of the gland from the seventh to the

sixteenth year of life is from 7 to 15 grammes. Thyroids of soft consistency appear by palpation to be smaller than they are in reality. Goitrous hyperplasia may develop uniformly in all directions, or only in one or two principal directions.

When a single measurement is to be made, the circumference of the neck should be taken at the base of the cervical region (see Fig. 1). From the age of seven to sixteen years, the normal average circumference—irrespective of sex—varies from 25 to 35 cm.

The antero-posterior diameter is measured from the seventh cervical apophysis to the sternal fourchette (see Fig. 2). A second measurement establishes the distance between the seventh cervical apophysis and the most prominent part of the neck when



FIG. 2.—Measurement of Antero-Posterior Diameter at Base of Neck.

the latter does not correspond with the region of the fourchette. In normal subjects from seven to sixteen years of age, this diameter measures from 7 to 9.5 cm.

Hunziker's surface measure is the mensuration in height of each single lobe and the total breadth of the gland (see Fig. 4). The height of a lobe is meas-



FIG. 4.—Measurements according to Hunziker: a b and a' b' = Height of Lateral Lobes; c d = Total Width of Gland.

ured either from the upper to the lower pole, or from the upper pole to the clavicle, when the lower pole

has become engaged in the thoracic cavity (see Fig. 5). The breadth of the gland is taken behind the cleido-mastoid muscles by a special compass (see Fig. 6).



FIG. 5.—Measurement of Height of Lobe.



FIG. 6.—Measurement of Total Width.

Hunziker's method is considered by the Commission as giving the most exact mensuration, when the dimensions, position and consistency of the gland permit one to outline the upper and lower poles of both lobes. In all other circumstances it only gives an approximate estimate. The divergence of the results are all the greater the softer the gland and the younger the subject. In order that the results obtained may be comparable the same amount of pressure should be made on the branches of the compass in all the mensurations taken.

As one in close touch with foreign medical literature, perhaps a few remarks on recent French medical books of genuine interest may not be out of place, as a conclusion to this letter. To the general practitioner and the gynecologist who does not consider every gynecological case as fit for operation, I would particularly call attention to Robin and Dalché's "*Traitement médical des Maladies des Femmes*," Paris, 1922, Vigot Frères, publishers. This is the fifth edition of this valuable clinical treatise written by men of large experience, and contains a great deal of matter not to be found in American or English works on the subject. I would add that the same publishers produced in 1920 a third edition of Agasse-La-

font's "Applications Pratiques du Laboratoire à la Clinique," a book that should be in the hands of every clinician and laboratory worker. Thoroughly well indexed and with a profusion of excellent colored figures and plates, this book, which treats of the practical applications of laboratory work to clinical medicine, should be greatly appreciated by the advanced practitioner.

A second, and thoroughly up to date, edition of *Marion and Heitz-Boyer's "Cystoscopic et Cathétérisme Uritéral"* has just been issued (1923) by Masson et Cie. of Paris. This second edition is of considerable interest, care having been taken to rewrite the chapter on optics and the interpretation of cystoscopic images. The writers are loud in their praise of Buerger's uretero-cystoscopy, and have greatly enlarged upon cystoscopic operative technique. The colored plates, of which there are forty-five, are admirable, showing about every lesion of the bladder that can be met with.

It is with pleasure that I note the appearance of the sixth edition (1923) of *Rogues de Fursac's* invaluable *Manuel de Psychiatrie, Foyer Alcan, publisher*. Among the new—or renewed—subjects studied by the author may be mentioned: the infectious psychoses, especially the mental disturbances dependent upon epidemic encephalitis, the treatment of general paralysis and epilepsy, and the constitutional psychopathic states.

The last section of the book is devoted to the medico-legal aspects of psychiatry, a most valuable and practical survey of the subject and of inestimable value to the practitioner and specialist.

Having mentioned new editions of standard works, I would now refer to three new books just issued, the first being Roger Glénard, "*L'Hépatisme*," published by L'Expansion Scientifique Française, Paris, 1923. The author, son of the well-known professor of Lyons, has collected the works of his father in the present volume, and has personally contributed to the subject of hepatism as developed by his distinguished father. The work is distinctly clinical and deserves perusal and study from those who would keep abreast with scientific medicine. Whether or not the teachings of Glénard be accepted or not in America, it may be said that they have stood the test of time and are favorably received in France and Switzerland.

The second new work—in two volumes—worthy of notice, is the "*Traité Technique d'Hématologie*," by J. Jolly, Paris, 1923, Maloine et Fils, publishers. This work is based on personal research of many years' duration on the physiology and pathology of the blood, but the chemistry, serology and parasitology of the blood are not included, the author regarding them as special branches. He has confined himself to the histological study of the blood and hematopoietic organs. Some of the chapters, such as those devoted to the embryonal development of the spleen, lymph nodes and lympho-epithelial organs, are highly original and deserving of special attention. The volumes are well illustrated and an excellent index adds to their value.

Lastly, we have F. Lejar's handsome volume: "*Exploration Clinique et Diagnostic Chirurgical*," Paris, 1923, Masson et Cie., publishers, a wonderfully practical treatise on surgical diagnosis, profusely illustrated and well indexed. The author's intention has been to produce a work devoted to clinical examination, in the strict sense of the word, and he has, we believe, succeeded. At the present time, physical, chemical and bacteriological examinations are highly important for diagnosis, but they do not belittle the value of palpation, percussion, etc. The book will be found to be of great help to the student, practitioner and the surgeon.

These notes on books are not offered as reviews, but are merely intended to call attention to the read-

ers of the JOURNAL to some of the best literature that has appeared since the war.

CHARLES GREENE CUMSTON.

NOTICES.

ERROR IN ADVERTISEMENT.

THE JOURNAL regrets that, through an error on the part of a compositor, the Saunders advertisement of June 7 contained a misstatement. Dr. Edwin T. Wyman is an Instructor in Pediatrics at the Harvard Medical School, not a Professor of Pediatrics as stated in the advertisement.

EMPLOYMENT FOR MEDICAL STUDENTS.

There is a need for employment for a number of Harvard Medical students during the summer and school year in order to defray their expenses. If any physician knows of afternoon or evening employment for such students, kindly notify Dr. George P. Denny, Office of the Appointments Bureau, Harvard Medical School, 240 Longwood Avenue, Boston, Mass.

HENRY A. CHRISTIAN, *Physician-in-Chief*.

CLINICAL DEMONSTRATION AT THE PETER BENT BRIGHAM HOSPITAL.

On Wednesday, June twenty-seven, there will be held in the amphitheater of the Peter Bent Brigham Hospital, from 10 to 11 o'clock, a clinical demonstration of diabetic patients, with particular reference to the use of insulin in treatment. All physicians are cordially invited to attend these demonstrations.

REMEMBER!

The annual registration under the Harrison Narcotic Act expires June 30. Renew before that date.

CASES REPORTED TO MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH.

WEEK ENDING JUNE 9, 1923.

Disease.	No. of Cases.	Disease.	No. of Cases.
Chicken-pox	185	Scarlet fever.....	295
Diphtheria	141	Septic sore throat... 4	
Dog-bite requiring antirabic treatment. 6		Suppurative conjunctivitis	7
Encephalitis lethargica	2	Syphilis	38
German measles.....	26	Tetanus	1
Gonorrhea	87	Trachoma	2
Influenza	2	Tuberculosis, pulmonary	139
Measles	863	Tuberculosis, other forms	1
Mumps	221	Typhoid	7
Ophthalmia neonatorum	19	Whooping cough....	219
Pneumonia, lobar....	56		

SOCIETY MEETINGS.

STATE, INTERSTATE AND NATIONAL SOCIETIES.

June, 1923.—The Nineteenth Annual Meeting of the National Tuberculosis Association will be held in 1923 in Santa Barbara, Calif., from June 20 to 23, inclusive, in the Recreation Center.
June, 1923.—American Medical Association, San Francisco, June 25-29, 1923; Olin West, Chicago, Ill., Secretary.
July, 1923.—Massachusetts Association of Boards of Health, July 26, Nantasket; W. H. Allen, Mansfield, Mass., Secretary.
October, 1923.—Boston Health Show will be held in Boston, October 6-13, inclusive.
October, 1923.—Meeting of the American Health Association will be held in Boston, October 8-13, inclusive.

For list of Officers of the Massachusetts Medical Society, see page xiv of the Advertising Section.